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COMPUTER WEEKLY

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# COMPEC '77 Owls a sure draw

LATEST in floppy disc drive technology, the double sided double density mini floppy, will be introduced at Compec in the form of products from two leading manufacturers — Shugart and Pertec.

Shugart's offering will be introduced by the California company's UK distributor, CPU Computers. Called the SA 450, it has an unformatted capacity of 440K bytes, while Pertec's drive, the FS200, can record 250K bytes unformatted on each side of a diskette.

Both units can be used in systems in place of the Philips or 3M type of mini-cassette drive and both measure 3¼ x 5¾ x 8 inches.

All the stands at Compec have now been booked and the wisdom of companies that have taken space at the show is symbolised by the owls seen here. They will be a major attraction on the Nashua stand along with their attractive friend, Carol. She will give them away as prizes to visitors wearing Nashua badges with lucky numbers.

Nashua says that three owls will be given away, one on each day of the show, and that the competition will be a straight draw which will take place at four o'clock each day—November 8 to 10.

## NEWS IN BRIEF

### CRC wins Info-line contract

CRC bureau has won the five-year, multi-million pound contract to supply online database facilities to Info-line, the information service company jointly owned by the British Library, the Chemical Society, the Department of Industry, Derwent Publications and the Institution of Electrical Engineers (CW, November 18, 1976).

The Info-line database of scientific, economic, research and patent information will run on CRC's Univac 1100 at Slough, Buckinghamshire and will go live in the second half of next year.

CRC was chosen for its telecommunications network which spreads into Europe.

### Chiller

EXPORT opportunities for Britain offered by the water cooling required for the new large scale IBM 3033 processor have not escaped Wright Air Conditioning of Birmingham. It has just shipped its first 3033 Compac water chiller to Germany to be used by the Rheinisches Genossenschafts EG of Cologne.

### R & D budget

OF the $120 million NCR is spending on research and development this year, about half is being devoted to software development, in particular applications packages for the new 8130, 8150, 6230 and 8250 small systems. The 8100 series machines have Intel 8080 based processors and the 8200s use a 16-bit mini.

### Range extended

THREE new versions of the ITT 6400 ADX large scale store and forward message switching system have been introduced, all using the new General Automation 16/440 mini-computer, which ITT calls the ITT 16/44. These include two specialised versions, the 6405 for air traffic control and the 6406 military version.

# Dol calls for X25 packet switched net

A PUBLIC packet-switched network conforming to CCITT recommendation X25 should be introduced as quickly as possible.

This was the main recommendation in the interim report of the Department of Industry National Committee on Computer Networks, published on Monday.

The Post Office should also adhere strictly to the timescales it announced, and should establish and publish proposed tariffs as early as possible, so that potential users could plan their usage of the network.

In connection with the Post Office's plans for a successor to EPSS, which are still under consideration, the report criticised the proposals being studied by the Corporation, which it regards as too limited.

This plan is for a national network with three nodes, probably in London, Manchester and Birmingham, with six other remote multiplexer access points. Such a network is expected to serve 4,700 user sites by 1983, but the committee believes that this figure should at least be doubled.

It spoke approvingly of the way the tariffs for the French Transpac network, due to begin service next summer, have been set to further national policy. In the case of Transpac, the tariffs will be distance-independent to encourage regional development.

Without necessarily coming down in favour of distance-independent tariffs, it believes that tariffs should be set to further overall national policy.

Three further CCITT recommendations, formerly known as XA, XB and XC and now called X3, X28 and X29, should also be adhered to in the new network. They cover respectively packet-assembly and disassembly hardware, PADs, the interface between the network and start-stop terminals, and the procedures between the terminal equipment and the PAD.

The Committee notes that the Post Office is to extend its facilities to communicate with Telenet and Tymnet in the US so as to cover Transpac in France next year.

It emphasised the importance of networking standard and calls on the Department of Industry to help the UK standards effort by supporting specific work programmes and assisting specialists to attend international meetings.

For the coming year, it is to carry out a nationwide survey of organisations, businesses and interested individuals in the field of communications.

It also wants to initiate discussions on the Post Office Act of 1969. Areas worthy of discussion include the possibility of allowing organisations to lease lines from the Post Office and offer users a communications service of a higher level than the Post Office offers, as added-value carriers like Telenet do in the US.

# Five more powerful models from Univac

THREE new 1100/80 and two new 90/80 models have been introduced by Univac, all featuring new compact processor logic and 16K bit memory chips. There is also a new large disc subsystem, the 8450, attachable to both 1100/80 and 80/80 and offering up to 4,900 Megabytes of online storage.

New entry-level 1100/80 offers 70% of the power of the 1100/81 announced last year (CW, November 11, 1976) and offers better price-performance than IBM's new 3031.

The 1100/83 and the 1100/84 offer similar improvements over the 3032 and 3033 respectively. They are three to four times as powerful as the 1100/81.

The cycle time of the new processors is 50 nanoseconds and the morory can be expanded from 512K to 4 Megawords. Further enhancements for scientific processing and improved subsystem availability are also planned later.

The main difference between the new 90/80-2 and 90/80-3 models lies in the processor cycle times. This is 130 and 98 nanoseconds respectively.

An entry-level 90/80-2 is claimed to have nearly 50% more power than the IBM 370/148 at about the same price. A 2-megabyte 90/80-3 is said to almost double the power of a 2-Megabyte 148. Maximum memory capacity is 4 Megabytes. Prices and delivery dates are not yet available.

# Union calls NCR ballot

A BALLOT to find out if NCR staff want to join the white collar union ASTMS, has been called by the union.

About 60 NCR staff who are already in the union met last week and decided to urge the Advisory, Conciliation and Arbitration Service to ask the company to agree to the ballot and to provide names and addresses of staff so that questionnaires could be sent to them.

An ASTMS representative said that of NCR's 5,000 UK staff, 1,100 were members of the union and another 1,600 were eligible. The company only recognised 800 members, these being field engineers. The other 300 were in sales and support services. "We want full recognition for all," he said.

# Hijack warning by Cogar

THE possibility that a state's data network might be hijacked by terrorists, the need for uninterruptible power supplies for terminals as well as mainframes, and the inadequacy of today's database software, are among the subjects that network specialists should be considering, according to George Cogar.

Cogar, regular contributor to Computer Weekly, will air his views as keynote speaker at an Infotech seminar on future networks, to be held in London from November 14-16.

He believes that databases are fundamentally uninteresting to DP professionals, who prefer to leave the concept of database administration to relatively unskilled people and instead concentrate on "interesting" types of software like operating systems and languages.

According to Cogar, the concept of a database implies that it can be accessed on an unpredictable basis for unpredictable reasons. Garbage on the input side can itself generate further elements in the database, which are then acted upon by other users, who then update the database until the original garbage is integral to much of the information stored. The more widely databases are available through networks, the greater the danger.

Other speakers include John McQuillan of Bolt, Beranek and Newman, Fritz Hondius of the public hav division of the OECD, and Donald Davies of the National Physical Laboratory.

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## Briefing

### US may ban sales to South Africa

PRESIDENT Carter is understood to be considering placing an embargo on the sale of some computer systems to South Africa, as part of any arms embargo that might be introduced as a result of negotiations at the United Nations.

Before the agreement of a UN resolution, the White House would not comment on the terms of an embargo. But earlier this year, the US State Department said that it would recommend the denial of export licences for computer systems destined for countries where there is reason to believe that they would be used in the suppression of human rights (CW, March 31).

### Intel branches out

BUBBLE memories and related magnetic storage media are to be developed by a new, wholly-owned subsidiary of Intel, Intel Magnetics. Prime movers behind the division's formation are three ex-Hewlett Packard staff, Dick Clover, Don Rose and David Cheng. HP is said to have a two-year lead but has yet to produce anything using the technology.

### Micro debut

A NEW range of LSI-11 microcomputers, the LSI-11/2 family will be introduced at Compec next week by Digital Equipment. They cost up to 42% less than existing LSI-11 machines, are fully program compatible, and are half the size. They can be plugged directly into the current backplane for the LSI-11. The new DEC 32-bit mini — page 36.

### Gamma challenge

COMPETITION for the Digital Equipment LSI-11 will be introduced at Compec by Gamma Telecommunications in the form of the GRC 11/X3 from the General Robotics Corp of Hartford, Wisconsin. The GRC 11/X3 is said to offer more power at lower prices than LSI-11 machines and is aimed at smaller systems houses.

### Micro kit for £200

A MICROCOMPUTER kit for under £200 has just been introduced by Lynx Electronics. Known as the Nascom 1, it incorporates a keyboard and TV interface and will be the subject of an all-day seminar later this month. Fore more details on this, a new micro-based Cobol sub-set language, and other related goodies, see Micro News on Page 28.

### Air strike ends

AIR traffic control assistants who have been on strike at West Drayton ATC Centre have voted to return to work, by 353 to 214. They also voted to accept a lump sum of £315, and an increase in salary of 4% with a possible 4% later, the balance to be paid when pay restraints are eased.

# Something special for Compec

NEXT week is Compec time again, and Computer Weekly, sponsor of the show, has got together something special for this preview issue.

Undoubted star of Compec will be the microprocessor, which is embedded in some form or other in most of the products on display.

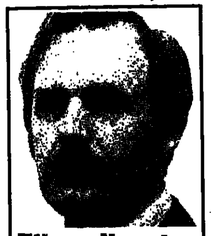
But there are many critics of the micro in our special supplement on the impact of the micro. One of its strongest critics, Ivor Catt, asks whether the micro could turn out to be a South Sea Bubble that will soon burst, with disastrous consequences.

On the more positive side, however, there are a number of articles which examine how the micro is helping to improve the quality and cost/effectiveness of many products and services.

There is also a typically humorous look at the world of micros and exhibitions from Stan Bootle, who writes from the great "Californian chip shop."

And Keith Jones reviews the highlights of Compec, with illustrations from Don and from the Colossal Cartoon Book.

**CHAMPAGNE PRIZE:** At Compec, Computer Weekly is running a Champagne Competition. See page 14 for details.



## Zilog director Vic Yates dies aged 43

**The microprocessor industry in Europe suffered a major loss last week, with the sudden death of Vic Yates, European marketing director of Zilog.**

**Yates, 43, had been with the company for just over one year, having joined Zilog from Motorola Semiconductors to take on the task of setting up the company's European operations. In that time he built up a successful network of distributors that has placed the company among the leading micro suppliers in Europe.**

**He was with Motorola for seven years, where he held such positions as marketing director for Northern Europe, and director of MOS marketing. He was involved with the microprocessor from its earliest days, being largely responsible for the early market acceptance of the 6800 family.**

# Honeywell to recast Level 66

DELAYS of at least 15 months in the production of its large-scale 66/85 processor, announced earlier this year, have led Honeywell to revise its plans for its large systems, which are currently under increased pressure from the IBM 3030 series.

The 66/85 is likely to be replaced by a more powerful processor in 1979. In the meantime, enhancements are expected within a week to the existing Level 66 and Level 68 (Multics) processors.

Honeywell is also enhancing its Level 6 mini line, including a new word processing system, emphasising the company's growing commitment to networks based on Level 6 and Level 66 systems.

First deliveries of the 66/85 were due last month but the development programme ran into trouble over the micropackaging technique for connecting several integrated circuits together to produce very fast multi-chip processor circuits (CW, October 6).

Honeywell has denied that there was anything wrong with the chips themselves, but according to one of its suppliers, Nippon Electric of Japan, there was trouble with the circuits as well as the packaging technique.

Honeywell says that the problems have largely been resolved, but acknowledges that it is now planning to use "new versions" of the current mode logic chips.

It is understood that Honeywell is evaluating two new Nippon Electric circuits, one of which is twice as fast as the ones which caused the trouble. Texas Instruments and Honeywell's own micro-electronics facility are to be the other sources for the chips.

The new Level 66 and Level 68 models are expected to include larger cache memories and new multiprocessor configurations, including six instead of four

● Turn to page 36

# 1907 was 100 times faster than a 2970

A 30-LINE compilation and run which took 11 seconds on a 10-year-old ICL 1907 at Southampton University, took 18 minutes on the university's 2970. This example of the performance of the 2970's VME/B operating system was given to Computer Weekly by Professor David Barron of the university's computer studies department.

Professor Barron said the actual Pascal compilation and run took four minutes. The rest of the time was accounted for by "very slow" processing of job control statements and by waits between each stage of the job.

The university's operations manager, Geoffrey Reeves, pointed out that Professor Barron's job was run under version 5X10 of the operating system and that the latest 5X23 version, now being implemented, would bring big improvements.

He added, however, "Professor Barron's remarks are still valid, because our machine is two years old and it's taken all this time to get anywhere near a decent performance. We have all been pretty depressed about it but things are getting better."

At Bath, where the regional centre for the south western universities has a 2980, the manager, Jim Brooks, said that after some initial communications problems the system was running extremely reliably.

"We lost two or three months because of the problems but we are pretty well satisfied at the moment," he said. "We had an early release of 5X23 and it hadn't been thoroughly validated but we are now assured by ICL that all the problems are sorted out."

# IBM services threat

CONCERN about IBM entering the services business in the US in a big way in 1979 has been expressed by the Association of Data Processing Service Organisations.

That year sees the end of an anti-trust settlement under which Control Data got IBM's service organisation for $16 million and IBM agreed to stay out of the services business (CW, January 18, 1973).

Jerome Dreyer, executive vice-president of Adapso, said there was no doubt that IBM would move into the services industry. "We are concerned about the strength of IBM and its added interests in communications," he said. "And 1979 is closer than we think."

Dreyer pointed out that anti-trust considerations would force IBM to form a separate services company. This could be an international concern, taking in the big computer centre near Warwick destined to house six mainframes and provide bureau services throughout the UK.

Alan Benjamin, director-general of the Computing Services Association, said that such an expansion of IBM's existing services organisation in the UK would set up a new momentum

He added, "The industry is well placed to take advantage of the new opportunities. We would work alongside IBM, not follow in its shadow."

## COMPUTER WEEKLY'S INSIDE NEWS

**SOCIAL SCIENCES**
Next week a conference will be held in London on the use of computers in the social sciences. Beverley Rowe provides an overview on the software packages available. Pages 34/35

**VARSITY RAGE**
A warning on the prospect of some bitter fighting for funds and an example of some low cost university enterprises are the main features of John Kavanagh's University Round Page 12

**DEC BITS**
Full details of DEC's new 32-bit mini announced last week. Page 36

**CHESSLAB**
Professor Donald Michie again provides an insight into computer chess playing. Page 31

**TRADER TALK**
The Sales Biz by Trader offers a regular window on the world of sales and marketing. Page 63

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Programmer Notes 30

**APPOINTMENTS — PAGES 37-63**

Win a trip to Holland

TWO trips to Holland in the spring are the prizes in a competition to be launched at Compec by Philips Industries and Computer Weekly.

The competition is to find the most meritorious, original and interesting new applications for standard digital cassette recorders.

Prizes will be awarded in two categories. One is for those who are students at a recognised institution of higher education at the time of entering the competition: the other is for everyone else.

Each prize will be for two people for three days over a weekend, and will include a return flight, accommodation and trips to Amsterdam and the famous Dutch bulbfields.

Closing date is February 28, 1978.

Further details can be obtained from the Philips stand at Compec.

## Threat to NCR plant averted

THE threatened closure of NCR's microelectronics plant in Miamisburg has been averted following a company decision to continue operations there.

The fate of another plant producing financial terminals in Dayton is still uncertain as discussions with union representatives have yet to be concluded.

Already 80 jobs have been lost from both plants and this is blamed on low order levels.

On-Time Systems

NEW WORLD is Citibank Financial Trust's new U.K. computer network. It's an ambitious project — an on-line financial system developed from scratch to support terminals at locations throughout the country. Highly cost-effective too, using duel minicomputers rather than a mainframe.

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# COMPUTERVIEW

## Putting Catt among the micro pigeons

"THE micro is a veritable South Sea Bubble that may suck us all in, burst and leave little industry of substance surviving in its wake."

That is the view of Ivor Catt, who this week provides a controversial introduction to our Compec preview, with its theme of the impact of the micro (pages 13 to 27).

Unlike Professor Dijkstra's recent attack on the micro at IFIP (CW, August 18) Catt's anti-micro views are based more on an anger that the potential of the micro might not be fulfilled due to architectural design errors rather than the software person's fear that it is a setback to the developments of good programming standards.

At Compec, there will be a great deal of evidence that, South Sea Bubble or Major Breakthrough, the micro is now as important to the structure and survival of the whole industry as it is to the individual products dependent on micro control.

A clear and vigorous analysis now of the possible pitfalls or delights of the micro is essential if Catt's vision of the future is to be avoided.

And that analysis and debate must be based on a perception of the future, not prejudices of the past.

There should be no humbug about the threat of the micro to good programming standards or to the role of the DP manager. Both of these issues are important but are dependent on factors other than the micro.

Factors such as the vision and dedication of management and staff to the development of adequate organisational structures and the implementation of imaginative and practical action programmes to create good standards, involve the user in the DP operations, etc.

What is important with the micro is that the industry — particularly the sales and marketing people — is not carried along in a euphoria of superficial sales spiel on the cheapness, ease of use, etc, of the micro.

There is no doubt that the micro has already made a very real impact in increasing the usability and profitability of the computer industry.

In dedicated applications, such as calculators and washing machines, they have already infiltrated into the public imagination, in a more positive way than the traditional computer image.

In America, the micro has spawned a "new wave" technological movement among the home brew market.

It is interesting to note, however, that most projections on the future of microcomputers stress that the major development will be in commercial and industrial markets, rather than with personal computing.

And this perhaps poses the most crucial test for the micro.

In the hands of thousands of home brewers the micro will be a potent force in the development of interesting and revolutionary approaches. But for that market, the onus is very much on the keen individual who will develop an in-depth knowledge of the systems.

For the commercial, industrial or government user, however, the total system, including software and engineering support, is crucial.

The small business user is particularly vulnerable to the oversell and a superficially attractive low-cost micro system could turn into an expensive nightmare if care is not taken in viewing the system as a whole rather than a low cost box of hardware tricks.

Catt's strongest attack is directed at the need for micros to prompt a total rethink of computer architectures, rather than implementing old architectures in new form.

"The microprocessor is a Chinese copy of the 1944 vintage Von Neumann computer. Its architecture makes no concessions to advances in programming and also no concessions to the advantages of semiconductor technology," he writes.

In many peripheral areas micros, are being used by designers to improve aspects of existing architectures, say by streamlining the control mechanisms for discs and printers.

Computer Weekly has maintained during the last few months, as the micro debate has ebbed and flowed, that the micro is an exciting challenge for the future. It is a fact of computing life. Its impact is already all about us.

But like all major technological changes, the dangers of the developments misfiring are tremendous.

The warnings of Catt should therefore be borne in mind by anyone attending Compec. At the same time, the doubts about the future course of micros should not cast too long a shadow over the range of products on show, many of which are already displaying the fruits of the micro revolution. And so far there has not been much bloodshed.

## Ten years ago...

**COMPUTER WEEKLY NOVEMBER 2, 1967**

THE minicomputer version of the PDP8, the integrated-circuit PDP8/I, was announced by Digital Equipment UK ... Computers were blamed for creating a "serious and ... drain on manpower resources" at a conference on computers and company organisation by the Institute of Cost and Works Accountants. The duplication of effort involved in the writing of standard applications by many different company DP departments was also criticised ... An electrical engineer who refused to answer questions on the 1966 census form on the ground that accuracy was not guaranteed for computerised data, was fined £5 by Sussex magistrates ... The Postmaster-General spoke in the Commons of plans for a national computing grid, based on multi-access computing, and which would form part of the National Data Processing Service ... National Computing Centre opened its first regional office for London and the South ...

# INTERRUPT...

LONG ago in the days when one of our major universities didn't have one of those big machines, but only an old, lovable, home-brew by the name of Titan, it was becoming increasingly clear that its capacity was not enough, even though its software was simply a joy to use.

The messages SYSTEM FULL, SESSION TERMINATED and RRRRRRRR were becoming more and more frequent to the multi-access users, even though no one actually knew what that last one stood for, although they did know that it meant a system failure with all your last half hour's editing lost.

There was also a very small time shared multi-programming system in operation in one of the faculties on which one of the Titan experts was supposed to be doing a project. He worked mostly at night, producing a large and varied selection of interesting programs that had little to do with his project.

Anyhow, one morning, the systems man of this machine came in to find on his desk the name of a program and the explanatory message: TITAN SIMULATOR. He hastened to a terminal, logged in and called the program. Sure enough, it began the usual Titan dialogue:

LOGGING IN
USER

He typed his USER ID. Then it typed:

RRRRRRRR

That meant: password please, which was typed over the top of the rubbish. There was a long pause . . . then: SYSTEM FULL, SESSION TERMINATED. And the simulator printed BYE-BYE and logged him out.

The moral is: whatever a simulation may do, to real life make it always true.

● **Submitted by John Davidson of Graphic Display Systems of Cambridge. He wins this week's £5.**


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# FOCUS ... on making a clean sweep

THERE could scarcely have been a more apt venue for last month's Computer Complex Cleaning Annual Workshop. In choosing the Industrial Society's headquarters in London, the organisers clearly hoped to set about reforming the normal working pattern. As a group, cleaners — at least at installation level — would hardly qualify for any industrial society label.

Unfortunately, few, if any, cleaners were in evidence, those present being senior technical cleaning management plus a strong contingent of environmental experts, from both industry and government.

It came as a surprise to discover the involvement of the Department of the Environment in such seemingly grubby areas. Maybe the constant need to clear away empty tea cups calls for special procedures.

The conference and subsequent workshop, indulged in sweeping many unpalatable facts of DP cleaning life under the false floor panels. There was much emphasis on critical read-write head tolerance and slope planes, circumference speeds of discs and the hazards of abrasive dust on magnetic tapes. All fascinating topics to those assembled, but the average site cleaner wouldn't know her tape-drive from her fire bucket.

Much was spoken about the consequences of a head crash. Perhaps more relevant would have been a comment on the damage caused by a vacuum cleaner crash in the computer room.

As ever, reality is far divorced from theory. However, the conference certainly served a useful purpose — if only to alert and, hopefully, alarm those responsible for cleaning organisations.

The chairman, Mr. D. Williams, in setting the scene, stated that the cleaning industry had dual priorities: to meet the needs of both machines and computer personnel.

The following speaker, Alan Warnke, elaborated on the theme. We all work better, he suggested, in an environment free from empty cartons, wrappers, coffee cups, scribbled notes and old copies of Computer Weekly. All too familiar, especially in a typical programming office.

The life of a cleaning operator is apparently not an easy one. Manufacturers have almost as wide a range of environmental specifications, as their machine ranges. In fact there is usually sufficient tolerance to accommodate most customers — whether in Bahrain or Scunthorpe. But at least cleaning executives know their limits where computer media and personnel are concerned.

Both are far more critical than the CPU — as leading punch operator Bella (of Liverpool fame) would testify if ... a draughty window.

The day's proceedings included a number of highly ... workshops dealing with topics as static, vibration ... plus routine and periodic ... ing programs.

Getting taken to the ... cular cleaners could ... been a pleasant expe... DP management.


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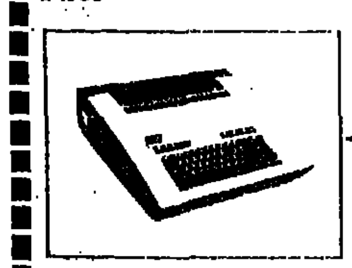

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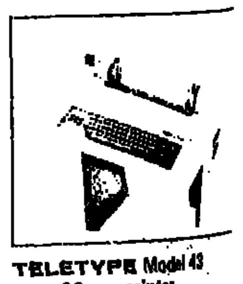

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**John Kavanagh reports on User Group developments**

# ICL users to rejoin national forum

THE National Computer Users' Forum has been given a major boost in status by an application for membership from the ICL Computer Users' Association. The application comes less than two years after the association resigned because too many non-user organisations were being allowed to join (CW, February 5, 1976).

The change of heart was explained by Dr Howard Wrigley, chairman of the ICL users' association, who said the forum was now well established, and influential organisations were seeking its views. These include the EEC, which has called for users across Europe to get together to put their views on the computer industry (CW, March 3).

"User associations must broaden their horizons," said Dr Wrigley. "They must step back from their close ties with their manufacturers and set out to protect their employers' interests. They must meet government agencies and put collective user views."

The forum's chairman, David Firnberg, director of the National Computing Centre, said, "I'm delighted at this further evidence among users of the importance of coming together to influence policy matters likely to affect them in the future."

The addition of the ICL association to the forum means that five major manufacturers' users are now represented. These are ICL, IBM, Digital Equipment, Univac and NCR users.

Notable exceptions are Burroughs and Honeywell users. The Honeywell users' association resigned at the same time as the ICL group and the Burroughs group resigned a week later (CW, February 12, 1976), but keeps in contact by going to meetings.

Tony Bale, secretary of the Burroughs users' association, said the forum was trying to do too much on too wide a front.

### First step

**UK users of Burroughs' computers have taken the first step towards forming a UK users' association. They are at present members of the European Association of Burroughs Computer Users, and have now formed a UK committee within that group to test the possibility of a UK association. Such an association would still maintain strong ties with the European organisation.**

**There are about 200 UK users in the European association, and these form about half the membership.**

**Two leading figures in university computing consider one of the most powerful configurations in higher education. The two are Professor Gordon Black (left), the first director of the National Computing Centre and now director of the regional computing centre at Manchester University, and Dr Henry Chilver, chairman of the Department of Education and Science's Computer Board, which oversees national spending on university computing.**

**The configuration comprises two Control Data 7600 computers with an ICL 1904S and a 1906A as front end processors.**

**The occasion was the official switching on of the 1904S and 7600. The four computers support users in 30 UK universities.**

# Baric's new service

A REMOTE batch online bureau service called Datacare has been introduced by Baric Computing Services. The concept of making computing facilities locally available to customers is the basis of the scheme. The data is recorded on either tape or disc and can be transmitted by line or post to the central Baric system for updates.

The Datacare system is centred on Baric business, stock control and accountancy software, and the use of the ICL 1500 series intelligent terminal.

Software for Datacare was developed by Computer Facilities Software of Cleckheaton, West Yorkshire.

This is the first time Baric has been involved with the supply of hardware. Speaking at the launch of Datacare, Peter Holland, managing director of Baric, said: "I forecast that in a very few years intelligent terminals will become almost as commonplace in business systems as the typewriter."

# Still united — despite £80 subscription

THE ICL Computer Users' Association is still largely in one piece, despite the introduction of a subscription to fund committee meetings and to support a newsletter (CW, May 19). At a meeting of the association's council last week it was learned that only the diminishing groups of users of old System 4 and Elliott 803 computers had resigned.

The System 4 users have formed an independent group because they feel they will get better service if they deal directly with ICL rather than through the association (CW, September 8).

The Elliott users have also formed their own group. These users are mostly schools and colleges with old, second-hand machines, and they have trouble raising the £80 subscription.

Dr Howard Wrigley, chairman of the ICL Computer Users' Association, said the KDF9 group had dissolved itself, mainly because there were hardly any KDF9 installations left, and the restructuring of the association into national organisations rather than a single international body had led to the resignation of ICL user groups in other countries from what is now the ICL Computer Users' Association (UK).

These groups were still active in their own countries and were members of the newly-formed federation of ICL user associations.

# Workshop on DP/user communications

*Date. December 1.*
*Venue. Holiday Inn, George Street, London W1.*
*Price. £45 plus VAT (£40 plus VAT for DPMA members) including lunch and refreshments.*

COMPUTER WEEKLY in conjunction with the Data Processing Management Association is organising a workshop on December 1 aimed at improving the skills of DP management in communicating with end users.

The workshop will be given by Nigel Laurie, who has more than 10 years' experience in the communications and computer fields. He is currently writing a series of articles for Computer Weekly on DP/user communications, which will form the basis of the workshop (see page 30).

Topics to be covered during the workshop include the management of user communications; aids to better communications; and practical guidelines to good user communications.

● **If you would like to attend the workshop, please complete the form below.**

I wish to order ..... ticket(s) at £45 plus VAT for the CW/DPMA workshop to be held at the Holiday Inn on December 1.

DPMA members can apply for reduced rate tickets via the form that is being sent to all DPMA members.

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# DOWNTIME

## *Home is where the micro is...*

I HAVE a strong feeling that, before many years have passed, Asimov's three laws of robotics will need to be enshrined as a United Nations Resolution to protect the humble, domesticated human.

The march of the micro into the home, an oft-predicted and no doubt soon to be realised event, will mean that strong controls will be needed to stop the things taking over. This at least, is one implication apparent from a scenario of life in a 1980s home, outlined at a recent meeting of industry executives by Ryal Poppa, president of Pertec. It went something like this:

Sharon (a housewife) is asleep. She is wakened by an alarm and, accompanied by the theme music from US educational television's "Masterpiece Theatre," the computer says, "Good morning, Sharon. It's 7:15am, Tuesday, October 18". It then gives her astrological and biorhythm forecasts for the day and tells her what her social activities are for the rest of the week.

The computer also reminds her, "Your Women's Club meeting is here tomorrow; prepare a jello salad. For dinner tonight, defrost the roast you wanted and I'll cook it (very condescending). Prepare tomorrow's menu and I'll give you the recipes you'll need. Remember Jack's birthday on Thursday. The Buick needs service this week. Your checking account balance is $242.41; your savings account balance is $6,834. Sign the checks I've prepared (this is worse than a bank manager in your cupboard). Coffee is ready (I don't remember asking for it). Have a nice day." Just how much of an instruction was that?

It makes me wonder who (or what) is in charge. With a simulated Richard Burton voice, the computer might just get away with it, but I still keep hearing the black Dalek.

## *Tongue untied*

"MY speedometer told me I was doing 30 mph, officer," might be the plaintive cry of many people in the future, if researchers at Edinburgh University get their way.

Being tutored in the gentle art of English (Scots?) is SID, an acronym for Speech Imitation Device. He talks to members of the linguistics department at the university regularly, but his offerings can still be classed as party pieces.

The next step is the development of programs to enable SID, and his inevitable successors, to "understand" English and the vast number of variations that it possesses.

"Any information system that presents that information (conversational English) in written or visual form could generate it in spoken form," said Dr John Laver, head of the phonetics laboratory.

"That means that any instrument, including everyday items like speedometers, could simply tell us what we need to know."

Already SID uses a "received pronunciation" technique, speech modelled on the sounds produced by the human vocal chords, and this is said to result in a "BBC newsreader" type of voice. Accents can also be included, one reported as bearing an uncanny likeness to James Mason, the actor.

Move over, Professor Higgins...

**A PRESS notice from Digital Equipment's German subsidiary suggests that the French people who got so hot under the collar about the invasion of their language by "impure" or foreign words may have companions in distress, informing us that computers are being used to enable customers to structure their own holiday packages from a wide variety of options, DEC writes: "Der Computer macht's möglich: Urlaub a la carte mit Airtour". Try saying that with a German accent.**

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# 'Let typist organise her own work pattern'

THE effects of introducing word processing to the office world need to be considered now, before it is too late, according to Tom Stewart, of Loughborough University of Technology.

Speaking at a word processing conference organised by Online and held at the Regent Centre Hotel, last week, he highlighted some of the problem areas.

"Some systems are good in terms of ergonomics, but some have negative aspects," he said. "We need to preserve the good features from manual systems rather than just moving over to automation. In addition, we need editing systems that are better than paper and pencil."

One good feature, says Stewart, is allowing the typist to organise her work pattern in a manner that suits her, rather than allowing the equipment to demand a rigid set procedure.

"The typist likes to move her typewriter around the desk, or to sit near a window," he said. "What must be done by manufacturers is to design equipment from the office function outwards, rather than vice versa. However, people will find a way to beat this problem; they will find ways of adjusting the system to suit them."

After considering the different areas involved in the production of printed business communications, Stewart gives these basic guidelines: "A thorough analysis of the paperwork and related functions involved should be carried out and prospective users consulted to help in identifying areas where word processing would be most needed.

"Also, job satisfaction should be maintained and ergonomic principles applied to the design of work stations. Relative merits of centralised/decentralised systems should be assessed and overall organisational needs should be met.

"And finally, if you have an intelligent system, that doesn't mean you can have dumb people operating it."

# 3m prints at their fingertips

**A New Scotland Yard filing operator processes a new set of prints for inclusion in the National Fingerprint Collection section of the £2.8m Ampex Videofile system. The Videofile will be used by the Fingerprint Branch of New Scotland Yard's criminal investigation department.**

A US computer system called Videofile is now being used by New Scotland Yard in its fight against crime.

Manufactured by Ampex of Redwood City, California, the £2.9 million system uses both video recording and computer techniques to store, and retrieve fingerprints held in the National Collection at the Yard.

It features two Data General Eclipse C/300s each with 96K memory, two DG 90 Mbyte disc drives, and two Ampex produced processors each with 65K memory.

Fingerprint identifications are made by manual comparison with fingerprints held on video tape. There will be a total of 2.9 million prints in two years' time.

Twenty Ampex terminals with split-screen facilities will be used to make the comparisons, allowing the operator to display the input print against any number of "possibles" selected from the video tape files.

There is also a latent print technique by which "fuzzy" prints can be enhanced.

Fingerprint experts are hoping that the introduction of Videofile will speed the identifying process by a factor of five and reduce paper-handling enormously.

A similar, though not so advanced, system is being used by the Royal Canadian Mounted Police in Ottawa.

## New publication

A NEW publication covering electronic developments in the Middle East is being test-launched by IPC Business Press. With a 5,000 controlled circulation throughout the Arab world, Middle East Electronics is to appear monthly. It is being compiled by the editorial staff of Electronics Weekly.

# Shell Oil sticks to dual machine policy

EXPANSION of Shell Oil's installation at Wythenshawe, Manchester, shows the company continuing firmly with its dual-machine orientation, despite periodic reports that it may be drifting towards becoming a pure IBM user.

The Univac 1108 at Wythenshawe has been replaced by a Univac 1100/20. This is currently being installed, and should be fully operational next month. Wythenshawe's other Univac mainframe, a 3 x 2 1110, will remain unchanged.

On the IBM front, Shell is at present installing the second of a pair of 370/158s. The first was installed earlier this year, and replaced a 360/65.

## Going West

BARCLAYS Bank has plans to relocate two of its London computer centres at Gloucester, in July 1979. Staff over the age of 25 are obliged to move in such a project.

The network of Micos minicomputers to handle order processing (CW, July 21) is progressing according to plan, with five sites now operating some applications. Ultimately there will be 12 minicomputer sites communicating with the Wythenshawe 1110.

The Micos mini is produced by US company MiniComputer Systems, and is based on the Data General Nova 3/12.

## Half the price

SUCCESS of plug-compatible IBM CPU suppliers in making inroads into the IBM System 370 base has prompted Bicaroe Inc of Cupertino, California to introduce a System 2 plug-compatible alternative to IBM's System 32 at the other end of the range. The System 2 costs $16,000, about half the price of patible alternative to IBM's 3741 data entry mode and can run all the IBM Industry Applications Programs and Systems 32 RPG II compiler.

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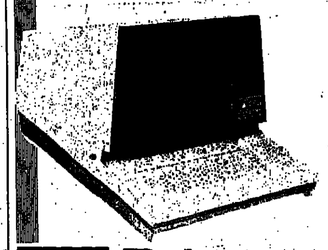

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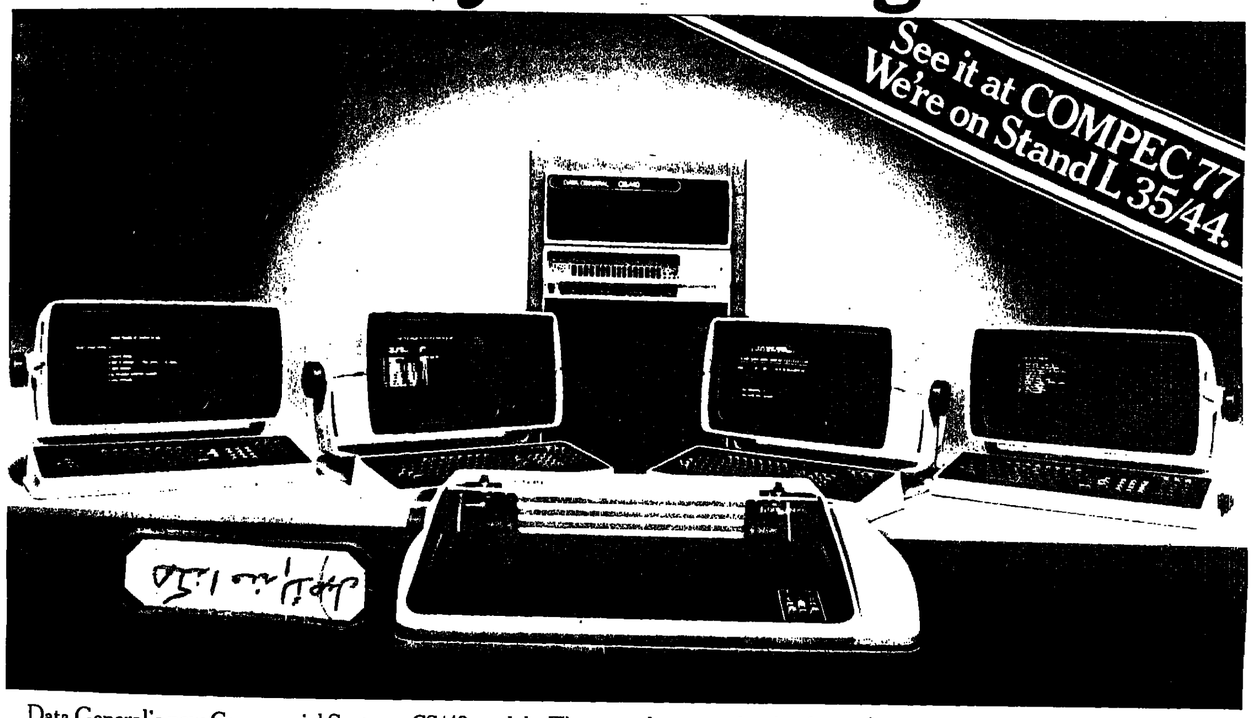


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# GILB'S MYTHODOLOGY

## *Is Garbage In Garbage Out at all relevant?*

GIGO — Garbage In, Garbage Out — is something we have all learned, a fundamental principle of data processing. And we all act as if we believe in it. IBM teaches it to your top executives, users believe it and feel guilty when something goes wrong, system analysts and programmers believe it and blame the user every time the system crashes due to "wrong input," almost all data processing textbooks include it in some form or another.

Yet I believe that it is highly misleading and even a danger to us all.

Let's start with a simple truth which we can all readily agree on. Garbage (some kind of incorrect input) does not have to result in a garbage output. It can be detected by automatic means, and somebody can make a correction.

"Yes," the analyst replies, "but what about all the "reasonable" imputs which are in fact incorrect?" To that, my reply is that if incorrectness is important to detect, then there is some way of designing the input, and its associated redundant correlated data, so that garbage due to chance errors and unintentional errors is detected with a very high probability.

One major problem here is that very few of our system designers and programmers have relevant training or even literature in the known set of techniques to detect these errors. Most of them have access to the 20-year-old classic "limit test" and check digit concepts, and little else that reflects the powerful logical capabilities of our computers and our databases. The few designers who do design something more sophisticated, do so from sheer intelligence and imagination.

The presently used technology does not, for the most part, make use of our present ability to store programs or to correlate input data with file, data and other input data as part of the error detection process. There is still a very strong technological hangover from punched card traditions of making sure that things are correct before a main run (by verification keying control runs), a tradition which was heavily duplicated with magnetic tape batch systems. The mythodology seems to be that a transaction must be checked and found correct *before* you try to reference the associated main records. Yet this is today a costly and result-delaying technique.

If you think that your installation is one of these sad cases, but that it is an exception to good current advanced programming practice, I can console you that these primitive traditions are widespread in computer installations all over the world which I have visited. No matter that they are using the largest and latest processors, languages and database software, they stick faithfully to the old data input checking traditions. Even in online systems I have been astounded to see how much of the numeric code, punched card data formatting and control mentality has been transferred to the online dialogue ("just to get it on the air quickly").

There are exceptions, those whose minds were never polluted by traditions and obsolete textbooks — people whose design is a result of common sense utilisation of their available tools to solve their real problems. I am grateful to these exceptions for many of the techniques I have been able to document for others. But they remain exceptions.

Perhaps it is not possible to communicate to the masses unless we use the Mother Church (IBM). IBM is no poorer than any other supplier or software house at teaching the new input technology. But they are no better. Their current literature on the subject shows no sign of a new idea or recognition of new economics since they published "Modern Coding Methods" about 20 years ago.

I hardly dare to whisper that we know how to perform fully automated correction to errors in input data. That we have been doing so for over ten years. That we have documented how to do it in *Humanized Input* and that the technology can be applied to most input situations profitably.

Garbage In Garbage Out applies to a special situation with no data redundancy (such as redundancy in your file, available without any extra keying) and no program logic to detect errors. That was the technology of the punched card tabulator. If your system obeys the GIGO rule, it is a sure sign that you are not making the most of your capabilities. People who cite the rule as though they believed it are displaying ignorance of fundamental parts of their technology, and it is about time we told them so.

My hypothesis this time is: **Garbage in should normally result in controlled detection and often result in automatic correction. It should almost never result in Garbage Out in a well designed computer system.**

# SOFTWARE FILE

# Role of computers in Parliament

WHILE Parliamentary committees and sub-committees debate the potential uses of computers in Parliament (CW, July 21), the computer has quietly been introduced into practical Parliamentary use by one pioneer who believes that practical experiment is of more value than protracted discussion.

James Taylor is a representative on a Parliamentary sub-committee dealing with nationalised industries — "my enemies call me an economic consultant, but I dislike the term". Faced with a variety of problems in the gathering and checking of information for committee meetings, he turned to the computer for solutions, assisted by the Com-Share bureau and the Central Computer Agency.

Taylor's first application of the computer was to the mathematical models which are often relied upon for the prediction of economic trends. Much of their evidence finds its way into government reports without any qualification of the dubious assumptions on which the conclusions may be based, he maintains.

Taylor devised a Cobol program appropriately called Bunkum, to perform a "general sensitivity analysis" on model data. For a certain percentage variance either side of the assumed value for any parameter, it indicates how much the results would be influenced by an inaccuracy. The program was subsequently rewritten in Fortran, under the name Sceptic.

A subsequent piece of software, Perturb, was designed to ease the phenomenal sequence of tasks surrounding the arrangement of a committee meeting and the subsequent marshalling of its findings. These interlocking tasks were scheduled using a Pert-type project control technique.

With his latest product Taylor has ventured into the text processing area. Adhoc (Accessible Documentation for the House of Commons) allows a file of free-format text to be indexed automatically by key-words. These words can be used to retrieve appropriate portions of the original text.

Adhoc has been used to record some of the proceedings of the sub-committee on which Taylor serves. The ability to recall particulars of these proceedings immediately greatly streamlines operations, compared with the usual wait of several weeks for the emergency of a printed report.

The system allows text to be retrieved by a single key or a Boolean combination of keys — suitable tribute to Taylor's great-grandfather, George Boole, the deviser of Boolean algebra.

In the initial generation of the index, the text is divided into significant and non-significant words, and the significant ones given index references, by Adhoc's internal dictionary. The user will also be notified of any words not known to the dictionary, and this process will automatically track most typographical errors.

According to the CCA, Adhoc is the first text retrieval system to be mounted on a bureau, though it is not generally available to Com-Share users. Taylor, however, thinks that such a system would be more economical on a small in-house machine, owing to high storage charges on bureaux.

Taylor is to present an account of his experience in designing Adhoc and his other software to the joint Parliamentary committee due to consider computer use in Parliament during the next session. Some members of this committee have already seen Adhoc operating.

He would not wish Parliament to take on Adhoc, but hopes that his report will persuade MPs of the value of experiment.

# Monitor supports 16 terminals

FOLLOWING Interdata's release of a Multi Terminal Monitor as part of its Dynamic OS/32 MT operating system (CW, October 20), news comes of a similar independent UK product, developed for a user, but planned for eventual general release.

The product, known as Terminal Control Task, was developed by consultancy Tripont, of Sunderland, as part of a facilities management contract for dump truck builder DJB Engineering, of Peterlee (CW, February 10).

Like MTM, it operates under the main operating system and co-ordinates the processing of online program development work and similar interactive tasks from several terminals. Tripont's product functions under Interdata's original OS/32 MT, as well as the Dynamic version.

Under the new Interdata OS, TCT should support at least nine and perhaps as many as 16 terminals.


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## Enthusiastic acceptance of Programmer's Workbench

THE growth of online program development has been widely welcomed by programmers. Even those in authority within, or over, the DP department are beginning to accept that the cost of running terminals is justified by the increased productivity of programmers in an online environment.

Researchers at Bell Telephone Laboratories, New Jersey, have produced the 'logical' extension to this environment: a private minicomputer dedicated to online development. It is linked to the mainframe by a communications line, down which programs and data are passed for testing.

Bell calls the concept a Programmer's Workbench, by analogy with the workbench of a carpenter or engineer, where most of his development tools are located. Similarly, the Programmer's Workbench mini contains the software "tools" required for program development, clearly separating them and the semi-developed programs from the production programs in the machine.

The current approach, with "tools" residing in the mainframe, "is equivalent to carpenters leaving their tools in each house they build", says Bell.

The software tools in the workbench include the expected program editing and compilation facilities and provision to submit testing jobs and interpret test results. Also implemented are tools to assist generation of narrative documentation, both for maintenance programmers and management.

Apart from the advantage of separating functions and lightening the load on the mainframe, the Workbench mini also aids conversion between different mainframe environments, Bell claims. A programmer, used to his workbench environment, would find little difference in developing programs for different mainframes.

Four Programmer's Workbenches are currently in use within Bell, all based on Digital Equipment PDP-11/70s, running Bell's own Unix operating system. The company claims that the idea has met with "enthusiastic user acceptance", both among its IBM and Univac programmers.


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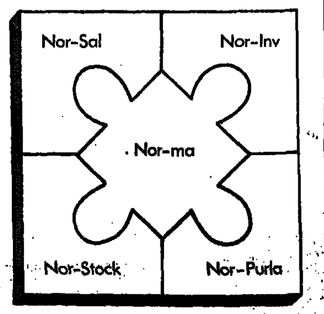


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# EDITED BY STEPHEN BELL

## Arabian office makes Prime sale

**THE office founded by Genesys Ltd in Saudi Arabia (CW, November 11, 1976), has proved instrumental in selling a Prime 400-based system to a European-based company. Construction consultants Ove Arup has ordered the machine for installation in its Riyadh office.**

**A 192 Kbyte configuration with three terminals, a plotter, disc and magnetic tape, the Prime 400 will be supplied and maintained by the Saudi Arabian Genesys subsidiary, SACMAC. Software will include the Moss highway design suite, developed by a consortium of UK county councils, as well as some in-house developed programs.**

**Ove Arup has also enlarged the memory of its UK Digital Equipment DECsystem-10, and is planning to install leased line communications to its Manchester and Liverpool offices. Future development of international communications is likely.**

# Coal Board pins faith in new mine operating system

WITH coal mining productivity in the news, the Minos computer-based mine control and monitoring system was given a timely first public showing at the Mining Machinery Exhibition in Birmingham last month.

Minos (Mine Operating System), has been developed by the National Coal Board, and is already installed in "six or seven" mines, said an NCB spokesman. A further "six to 10" are planning to install Minos.

The system is based on a Digital Equipment PDP-11/34 minicomputer. Its applications fall under two main headings: environmental monitoring and control of transport of coal from the face and of other vital machinery such as pumps.

Interface with an operator above ground is through a visual display unit and a special keyboard, with keys specifying elements of the system, and functions, such as "start", "stop" and "load". Commands can thus be transmitted by depressing a pair of keys, but a command will only be carried out if it does not violate pre-programmed safety conditions. The VDU displays messages associated with machinery operation, as well as data and alarm warnings from the environmental monitoring instruments, checking such factors as levels of dangerous gases.

Minos represents the first step towards true automation of mines, said NCB spokesman Ivan Bexon. Previous systems provided remote control, but required human initiation and checking of every step.

Besides automating mine control, Minos is an innovation in another sense. It is intended to be the first standard mine control system.

The system has been conceived in modules so that different combinations can be put together to cater for mines with different organisation and machinery resources.

The visual display character generation equipment for Minos is supplied by Terminal Display Systems, but the VDU screens will come from various suppliers. Software for the system was written entirely by NCB staff.

Work is already going on elsewhere in the NCB towards automating the actual digging of coal at the face.

Minos, the Coal Board predicts, will not only improve the efficiency of coal mines in the UK but, it is hoped, will prove a successful export.

# Scicon to market management product

THE production control field may already seem overcrowded with software products, but Scicon has now decided to venture into the area with a US-originated product which it sees as still filling a gap among small machine users. About six UK users are already considering implementing the software.

The product is known as Manman (Manufacturing Management), and was developed by ASK Computer Services of California. Scicon has taken exclusive marketing rights to Manman in the UK, and non-exclusive rights in Continental Europe. The company will sell Manman chiefly as a turnkey system, in conjunction with the Hewlett-Packard 1000 minicomputer.

Manman handles a variety of production related applications, including inventory control, bill of materials processing, materials requirements planning, purchasing of raw materials and components required for manufacture, monitoring of work in progress and management reporting and product costing.

The product is thus claimed to assist the whole of the manufacturing process, calculating the raw materials and components required to meet a given order, judging whether existing stocks and outstanding purchases will meet the requirement, keeping track of the completion of purchase orders and, perhaps most important, regulating the manufacturing process to ensure efficient use of manufacturing resources.

Manman can be accessed interactively through terminals from several points of a company's factory and offices. All six modules refer to a common database, maintained under HP's standard Image database management system.

A minimum Manman system, with hardware, costs £55,000. The software is valued at about £20,000, but Scicon does not anticipate many sales of the software alone.

## Puzzler

THERE are three known ways of expressing 100 as the sum of three cubes. Two of these involve large numbers, i.e. 100 = 161³ — 139³ and 1,870³ = 1,797³ — 903³, but the third formula has much lower figures.

Can you find it before turning to page 63 for the solution.


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# BOC plans text retrieval service

A NOVEL bureau service is planned by BOC Datasolve, to take advantage of the expected growth in the automation of offices. The bureau is "actively looking at the marketplace" for text-based information retrieval. Several rivals are reported to be not far behind.

Datasolve has not finally decided on a product to offer in this field, said a spokesman, but the Status software, developed by the Atomic Energy Research Establishment at Harwell, is being examined in detail.

Status was developed several years ago to retrieve texts of statutes relating to atomic energy. One of its major triumphs was its inclusion in ICL's successful bid for the European Commission's installation (CW, October 28, 1976). Its applications now, however, have spread far outside the area of legal documents.

Datasolve believes that it will be the first UK bureau to offer information retrieval of this type. Retrieval of information from specialised databases is already being provided for on several bureaux, but a system of the Status type will allow the user to enter and maintain his own data.

A text entered to Status can be scanned fully and all significant words inserted in an index if required. Many information retrieval systems allow retrieval only on a limited number of keys.

Datasolve looks forward to a profitable future for the automated office. The concept has already begun to take off with the adoption of word processing, and information retrieval of the Status type is an ideal application to interface with this, the bureau believes.

Datasolve does not expect text-based information retrieval to take off in earnest for about another two years, but obviously wants to get into any potential market ahead of its competitors. A firm date for the release of Status or a similar system has not yet been decided.

Datasolve is not the only bureau interested in Status, admitted a spokesman at Harwell. The AERE is "looking for outlets for the system", but declined to give further details at present.


## ROSCOE the librarian/online

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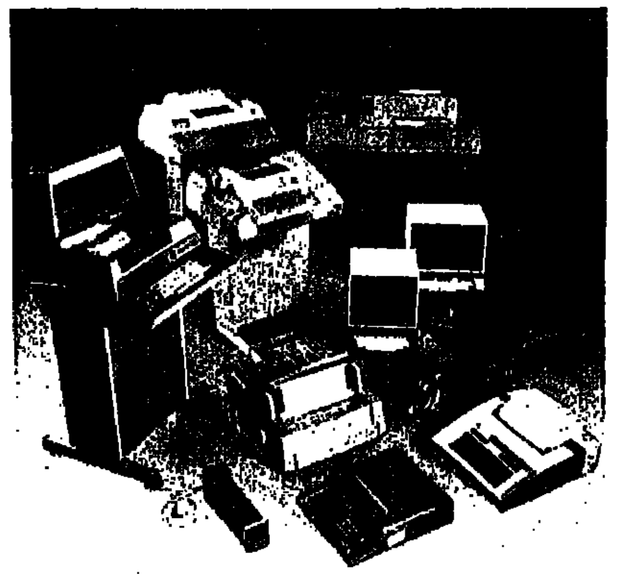

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## COMPUTER WEEKLY

The following special supplements are due to be published during

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**NOVEMBER 10th INTERNATIONAL EDITION**

The November issue of Computer Weekly International will feature a detailed report of Systems 77, which was held in Munich, Germany, this month. Together with all the latest news and developments which has occured during the past month in other parts of Europe and the U.S. With an overall distribution of over 98,000 (U.K. 78,885, Overseas 19,138) this issue will provide an ideal opportunity for export minded companies to display their products, equipment and services to this unique audience of decision makers throughout Western Europe.

**COMPUTER EDUCATION — NOVEMBER 17th ISSUE**

Computer education is not just teaching fifteen-year-olds the difference between a punched card and paper tape or showing them how to program in Basic.

For although, happily, computer education is starting earlier and earlier in our schools, possibly the biggest education job still has to be done among adults.

Our education supplement on November 17 covers both sides of the problem, with the spotlight first going on the Inner London Education Authority to show what can be done at school level then articles on the government's TOPS training scheme and the National Computing Centre's Threshold training scheme for school leavers.

There will also be a look at the problems of educating the end user about the firm's computer department. And details will be given on the Plato computer assisted instruction system now being introduced to Europe by Control Data. Read Computer Weekly on November 17 ... and learn something.

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Stephen Measures 01-261 8293, Tony Kaminski 01-261 8022, Stuart Moore 01-261 8109, Lloyd Collins 01-261 8787.

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# PEOPLE

CHEERFULLY slicing into a Redifon terminal is Frank Watson, superintendent of the Redifon factory at Peacehaven in Sussex. The occasion was the completion of the factory's 2,000th Seecheck terminal. However, the terminal in the picture is in fact a 50lb cake, baked and iced with loving care by electronic wirewomen Doreen Stockdale (centre) and Rosemary Owen.

Alastair Gowan, until recently MD of General Electric USA Plastics in Bergan op Zoom, the Netherlands, has been appointed general manager of GE's Europe business division.

Susan Bing, formerly management accountant with software house Pamela Woodman Associates, has been appointed financial director of the company.

## Ross and squash

A COMPUTER services company, Ross Computers, of Cwmbran in Gwent, is to sponsor the Welsh open amateur squash championships in Cardiff on November 18-20.

It is the first time Ross has been involved in sports sponsorship. Its managing director, George Porter, is a member of Cwmbran Squash Racquets Club and the company has its own internal league.

It is hoped that the finals of the main events will be held at St Mellons County Club. Entries close on November 9 and should be sent to Martin Lewis, 113 Bedwellty Road, Cefn Forest, Blackwood.

**Martin Lippman** has been promoted to the new position of general manager of Prime Computer's Scandinavian subsidiary. He was formerly director of the Bedford sales region for the UK subsidiary.

**Donald Bracken** joins Modular Computer Systems, Modcomp, in Fort Lauderdale, Florida, as treasurer, from the First National Bank of Boston.

Baker Banks

**Norman Baker** of Memory Business Machines, a company within the Memory Ireland group, has been promoted from sales executive to manager for the Munster area.

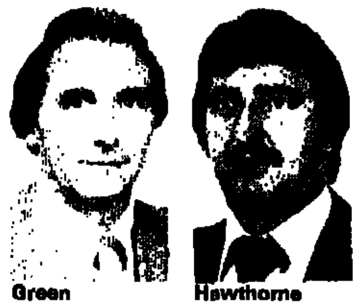
**Malcolm Banks**, a TP specialist with Cara Data Processing, has been appointed manager of the new hardware products division in Dublin.

**Ken Burnham**, previously a senior manager with NCR UK, has joined DPSC, the recruitment consultants, as managing director. Recently appointed managing consultants with DPSC are **Ian Pryke**, former computing services director with Mobil, **Bob Sibbell**, who was European sales manager with Intersil, and **Peter Cooper**, ex-large accounts manager with Burroughs.

**Don Bell** has been appointed to the newly-created position of executive vice-president and chief marketing officer with AMI Microsystems Inc in the US. He was formerly president of Electronic Arrays Inc.

The first of two AMI board members appointed under a new agreement between Bosch and AMI is **Rudolf Scharpff**, managing director of Robert Bosch GmbH of West Germany. After purchasing AMI shares, Bosch now holds about 25% of AMI's outstanding shares.

**Peter Green** has been promoted, at Willis Computer Supplies, from area representative to sales manager.

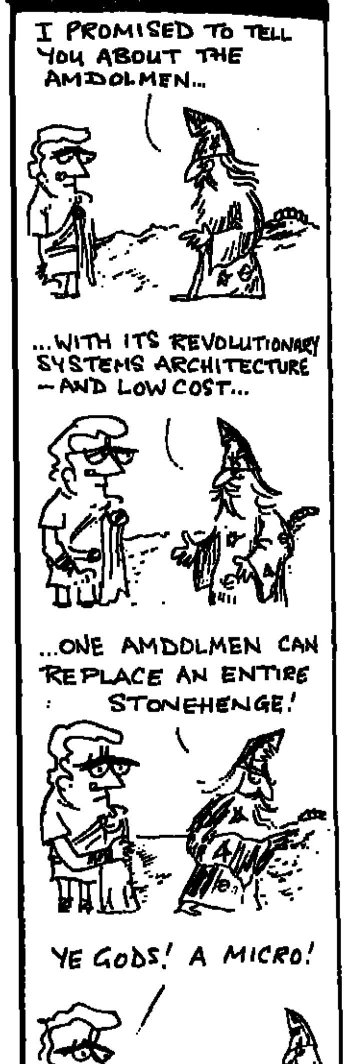


Green Hawthorne

**Mike Hawthorne**, DP manager of Kwikform, has been appointed managing director of the newly-formed Forward Computing bureau.

## Liveware Saga

by Don




## DIARY

**NOVEMBER 7**
Fact retrieval system for the Edinburgh Western General Hospital. Edinburgh University Machine Intelligence Research Unit. Hume Tower, George Square, Edinburgh. 17.15.
Shop-floor information systems, seminar. British Production and Inventory Control Society, Cambridge branch. Garden House Hotel, Cambridge. 9.00. Registration with BPICS. 0273 38188.
Microprocessors. Prof F. G. Heath. BCS, Glasgow branch. Daniel Brown's Restaurant, Glasgow. 19.00.

**NOVEMBER 8**
Social applications of computers in local government. Lorraine King, John O'Brien. BCS, Croydon branch Fairfield Halls, Croydon. 19.15.
Communicating sequential processes. C.A.R. Hoare. BCS, Reading branch. Cooper Inn, Pangbourne, Berks. 20.00.
Professional standards in dealing with first-time users. David Firnberg. BCS, First Time Users Group. Royal Angus Hotel, Birmingham. 14.00.
British pioneers in computing, Colossus. Prof Brian Randall. BCS, Newcastle branch. Barras Bridge Bldg, The University, Newcastle-upon-Tyne. 19.00.
A systems approach to pictorial pattern recognition-lecture series. Morton Nadler. Machine Intelligence Research Unit. Chess Lab, MIRU, University of Edinburgh. 10.30.

**NOVEMBER 8-11**
Compsac 77, software and applications conference. IEEE Computer Society. Chicago, Illinois.

**NOVEMBER 9**
How AICS can help you, the independent computer professional, new members introductory meeting. Association of Independent Computer Specialists. AICS Headquarters, 8 Leicester Street, London WC2. 18.30.
Retail point-of-sale systems. BCS, Sussex branch. Gatwick Manor Hotel, Crawley. 19.30.
The Crossbow information retrieval system. E. Hyde. BCS, Teesside branch. Teesside Polytechnic, Middlesbrough. 19.00.

**NOVEMBER 9-10**
Exhibition and demonstration of university, schools and industrial projects. National Development Programme in Computer-Assisted Learning. SCET, 12 Rose Street, Glasgow. Details: 01-637 0552.

**NOVEMBER 10**
BACS, Banking on the future. BCS, Kent branch. Computer Lab, University of Kent at Canterbury. 19.30.
The practice of structured programming. D. P. Middleton, G. Crawford. BCS, Wolverhampton branch. The Polytechnic, Wolverhampton. 19.00.
Practice and techniques of structured programming. D. Simpson. BCS, S Yorkshire branch. Brincliffe Oaks Hotel, Nether Edge. 19.15.

**NOVEMBER 10-11**
Conference on data structures for survey analysis. BCS Computers in Survey analysis. BCS Computers in Survey Analysis Group. City University, London EC1. Details: Beverley Rowe, 01-609 0340.
Scottish Gathering. IBM Computer Users' Association. Excelsior Hotel, Glasgow Airport.

**NOVEMBER 14**
The state of play in computer chess. Edinburgh University Machine Intelligence Research Unit. Hume Tower, George Square, Edinburgh. 17.15.

**NOVEMBER 14-15**
Joint European/US software management conference — government programmes. American Institute of Aeronautics and Astronautics/Deutsche Gesellschaft fur Luft- und Raumfahrt/IEEE Computer Society. Munich.

**NOVEMBER 15**
Coral 66, a review of implementers' experience. BCS, Coral 66 Group, IEE, Savoy Place, London WC2. 14.00.
Computer understanding by structural thesaurus techniques. Philip Sallis. BCS Natural Language Translation Group. King's College, London WC2. 18.00.

**NOVEMBER 15-16**
Meeting. IBM Computer Users' Association System 3 Group. Bedford Hotel, Brighton.

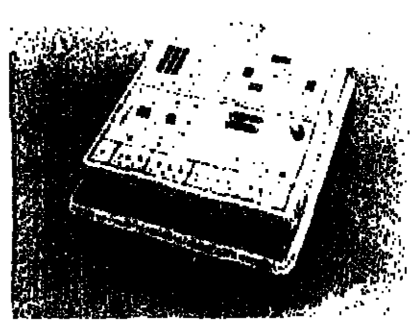
**NOVEMBER 15-18**
Metering, apparatus and tariffs for electricity supply, conference. IEE/IEEE Organisation Internationale de Métrologie Légale. London.

**NOVEMBER 16**
Management Education Seminars — Communications. Dennis Jarrett. Data Processing Management Association. Montcalm Hotel, London W1. 14.00.
Database on mainframes and minicomputers. D. Trimmer. BCS, Leicester branch. James Went Bldg, the Polytechnic, Leicester. 19.00.
Machine intelligence. Ray Cahart. BCS, Dundee branch. College of Technology, Dundee. 19.00.

**NOVEMBER 17**
The national police system. G. F. Atherton. BCS, Leeds branch. Parkway Hotel, Leeds. 18.30.

**NOVEMBER 17-18**
Exhibition and demonstration of university and schools projects. National Development Programme in Computer-Assisted Learning. New University of Ulster, Coleraine, Northern Ireland. Details: 01-637 0552, 0265 4141 ext 341.


Data Communications Diagnostic and Dialogue



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# IBM's mini project back in Orbit

AFTER dropping to a very low priority about a year ago, IBM DP division's Orbit minicomputer project has been brought back to the fore, and US observers expect the mini to be announced next April as DP Division's alternative to General Division's Series 1.

According to Gideon Gartner, analyst with New York stockbrokers Oppenheimer and Co, Orbit is a "highly supported reorganised development activity at IBM's Raleigh, North Carolina facility," with 200 professionals developing software for what promises to be a powerful mini.

The minicomputer is expected to broaden further the range of networking options open to users. To some extent it will provide an alternative to the fairly limited 3790 and 3705 remote communications systems, but there is no question of it supplanting these products completely.

After a slow start, the 3790 began to find widespread favour about a year ago, and one customer in Italy, for example, is reported to be installing 237 of them. The product had a further boost with the enhancements announced in the summer (CW, May 26).

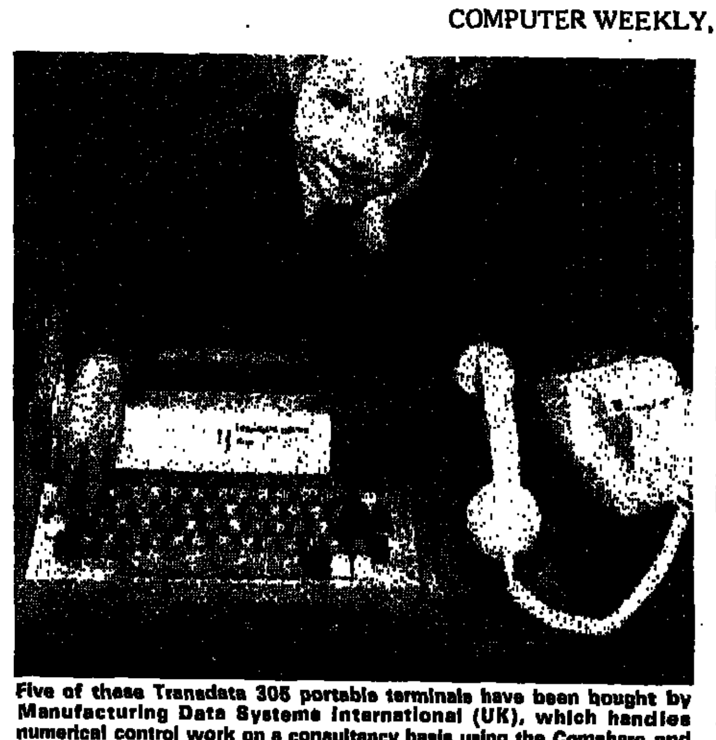
One interpretation of the growing overlap of products from the IBM DP and General (ie small) Systems Divisions is that IBM is making each division as comprehensive and self-sufficient as possible as a defensive move against the possibility that some anti-trust settlement might be reached which required the company to split into three or four autonomous companies. The most likely split at present would be into four: DP, GSD, Office Products and computer services, including the Satellite Business Systems interests.

Another is that IBM is planning a major re-entry into the computer services business now that its anti-trust settlement, under which it sold the Call-370 service to Control Data and agreed to stay out of the services business for five years, is about to expire. Orbit, Series 1, 5100, System 32 and System 34 would then become potential service bureau terminals, already installed at user sites.

Orders for the Series 1 minicomputer stood at 5000 at the beginning of August, nine months after its US launch (CW, November 18, 1976). According to the California-based planning company Input, almost 80% of the orders came from OEM manufacturers, despite the fact that IBM gives no discount for quantity on Series 1.

The most important reason voiced by US users for buying Series 1 was the wide coverage of IBM's maintenance facilities.

Input estimates that IBM's entry with Series 1 will be beneficial to the minicoputer market as a whole, causing it to expand by 1 per cent this year and about 8 per cent in 1981.



Five of these Transdata 305 portable terminals have been bought by Manufacturing Data Systems International (UK), which handles numerical control work on a consultancy basis using the Comshare and Tymshare bureaux. The junior operator was not included in the £6,000 price.

## US components on show

SEVERAL US manufacturers of microprocessors and memory components that do not usually appear at exhibitions on this side of the Atlantic will be present at the US Trade Centre, Langham Place, London W1, next week for Compelex, claimed to be the largest ever American electronic components show in the UK.

The show, from November 7 to 11, will include exhibits from Sunertek, Western Digital, Scientific Micro Systems and Circuit Technology, as well as more familiar names like Intel, Intersil, EMM and Monolithic Memories.

## The impact of electronics

**TO examine the effect that electronics has and will have not only on computing but on many other areas of industrial and domestic life, a major international conference is to be held in London on December 8.**

**Called The Impact of Electronics, the one-day conference will have among its speakers Jack Akerman, managing director of Mullard, Dr Steve Forte, managing director of General Instrument Microelectronics, Alex d'Agapeyeff, chairman of CAP, and Dr Alfred Prommer, vice-president of Siemens AG.**

**The conference is organised by Electronics Weekly, and the fee is £60. Further details are available from the conference administrator, IPC Business and Industrial Training Ltd, Surrey House, Throwley Way, Sutton, Surrey SM1 4QQ.**

## Gamma orders

TWO DEC-based systems are to be supplied by Gamma Data Systems, Dublin. The first is for the head office of Superquinn, the Irish supermarket chain and is valued at £45,000. The second order is from the Western Pride Bakery and this system is worth £35,000.

## OP SPOT

. . . this week looks at some of the differing demands that can face the operator moving between installations.

## Challenge to the man on the move

THE role the operator plays depends on the size of the installation and the applications supported by the system.

A new entrant to operations in a large installation will experience a different introduction to computing from that received by a trainee in a smaller environment. In the larger installation trainees usually spend their first three or four months operating and maintaining a particular part of the installation, such as printers.

In contrast, the trainee in a smaller environment must quickly adapt to the circumstances and learn the various aspects of operations. In this type of installation everyone is kept busy and there are not enough operators to justify a new person being involved in just one part of the task.

The smaller the installation, the more responsibility the operator takes on and he is able to use his initiative to a greater extent. Often he will take each job through all the aspects of operation, including preparation, actual processing and then printing of any listings produced. He might also be involved with arranging the transportation of output to users.

By comparison, the operator at the larger installation will often concentrate on one particular part of operations on a rota basis. As such he might have several trainees under his guidance and be expected to provide them with a certain amount of tuition. Consequently in such an environment the level of technical competence is often of a good standard.

The manner in which operators acquire their skills also varies in accordance with the size of the system. In the larger installation operators are often given the opportunity to spend time in the job control and technical support sections, while those in the smaller installations have to acquire their knowledge in a practical manner.

The larger the installation the more peripherals it is likely to have, and this means more maintenance and cleaning for the operator. Cleaning of tape drives, printers and card readers will often be done on the night-shift.

The operator's task will also be greatly affected by the applications supported by the system. For example, with the sort of antiquated card-based systems which still exist, the operator will spend a good deal of his time with card readers. In such a situation the burden of the task is often shared out on a rota basis.

In contrast, the operator involved with a system engaged in TP might spend much of his time in a user liaison role. Some installations provide a section dedicated to problems arising out of such things as TP lines going out of service. Again this is related to the size of the installation.

So an operator moving between installations must be prepared to accept that his job will change to some degree. Although the hardware and software may be similar in various installations, the manner in which they are used is often very different.

## Had a good weekend?

**"Disgruntled of Sussex" expresses his view on shift pay in the form of a playlet. The time is 9.00am on a Monday.**
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**Operator: "All right, but a bit tired."**
**DPM: "Have a nice weekend?"**
**Op: "Not too bad, although I had to catch up on sleep after the 2.30pm to 10pm shift last week."**
**DPM: "Did you play football this weekend?"**
**Op: "No, I haven't been getting to enough training sessions because of shift work."**
**DPM: "Everything else OK?"**
**Op: "Yes, if you take into consideration my earache caused by the line printer and the boredom of being on my own from five until ten every night on the evening shift."**
**DPM: "Well, at least the company appreciates what you're doing with its generous shift-allowance."**
**Op: "Thank heavens my unsocial life means so much to the company — all 12½% worth!"**


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# UNIVERSITY ROUND

EDITED BY JOHN KAVANAGH

## 'Strained relations on funds' warning

A GOVERNMENT bid to save money in university computing by encouraging co-operation between computing centres could be counter-productive, because the policy is putting extra strain on relationships between universities.

This message was put over by Professor Ian Pyle, director of York University's computing centre, at the opening of the centre last week.

Professor Pyle said that the influence of the Department of Education and Science's Computer Board, which oversees university computing, had brought a degree of co-operation between computing centres unmatched in any other subject.

"However," he went on, "relationships between universities may get somewhat strained in the future as a result of the regionalisation policy of the board, under which the finance for peripherals and enhancements in each region is to be distributed by agreement among the universities in the region."

In happier economic times all money was allocated to individual universities by the Computer Board. Although this still applies to mainframe computers, Professor Pyle said that more than ever before universities were in competition for funds with other universities in their region.

He added, "We hope to prevent the relationahip between the Yorkshire universities becoming strained by being aware of the possibility of it happening."

Professor Pyle said that further managerial strains could result from the board's plan to form a nationwide network linking universities and thus make facilities provided at different sites available to the widest possible range of users (CW, January 13). "We are all apprehensive of the administrative and managerial problems which are bound to arise."

York's new computer centre brings previously scattered facilities, including the main Digital Equipment DECsystem-10, under one roof, and gives the computing science department the chance to open a digital systems laboratory, which enables students to get to grips with minicomputers and microprocessors.

The opening also coincides with the upgrading of computing science from a subsidiary subject to a main degree course.

## For students and staff

**A JOINT venture aimed at providing computing facilities both to students and to administrative staff is under way at Strathclyde University, with second-hand computers from Honeywell and ICL as main contenders for the contract.**

**The university administration has a GE 415 and provides time sharing services to students on this old machine. Now that the machine is due for replacement the two sets of users are getting together to finance a newer machine. The main student and research computing service is provided by an ICL 1904S, and a 1900 and a Honeywell 6060 are the machines offered to replace the 415.**

**The Department of Education and Science's Computer Board is providing most of the money for the new machine, and the university is providing accommodation. The GE 415 is used about equally by the students and the administration, but the extra capacity on the new computer is expected to be taken by the academic rather than the administrative users.**

## Essex 'do-it-yourself' repairs commended

IMAGINE getting old ICL peripherals from a scrap-yard, cleaning them up and interfacing them through a minicomputer to your non-ICL mainframe. Or employing your own engineers to do instant repairs and maintenance to your computer system and making a profit on what it would cost to have had the job done by an outside firm.

This is what Essex University has done — and it has been so successful that the Department of Education's Computer Board has pointed it out to other universities.

Essex has an engineering group of four, headed by Brian Wilby, which maintains the Ampex memory on the university's main machine, a Digital Equipment DECsystem-10, and looks after 45 Teletypes around the campus.

"We charge some departments for maintenance services and our contracts for Teletype maintenance pay for a technician's salary. And the users get a better response time than they would from an outside contractor," said Wilby.

"We have a PDP-11/40 which interfaces cheap old ICL peripherals to the DECsystem-10. We strip the old kit right down and refurbish it and use it again. Last year the group made a profit for the university."

The engineering group has designed its own electronic keyboards for Teletype terminals and is now replacing standard mechanical keyboard at the university with electronic ones.

## New ideas in digital design education

AN imaginative approach to the education of students in digital systems design is being applied successfully in Newcastle University's combined Electrical Engineering and Computer Science course.

At a cost of between £300 and £350 per student, the Digital Systems Laboratory is able to provide each student with a basic desk-top frame. It includes 16 buffered light-emitting diodes, 16 logic level switches, six uncommitted switches and three banks of edge connectors into which circuit boards can be slotted. A basic board into which integrated circuit options can be slotted has been designed and a working system can be built using the frame.

Microprocessors are now included in the range of options open to the students.

"At our price, there were only two micros we could afford," says John Givens, lecturer in charge of the laboratory. "They were the 8080 and the 6800, and we chose the latter because the documentation is better and there are more interfaces around it.

"For larger programs, we have a paper-tape interface for program loading, and there is a cross-assembler on the university's IBM 370/168 for paper tape preparation.

"There is a wire-wrap machine which was built for us by the department of mechanical engineering, so we can do small printed-circuit board runs," says Givens.

The success of the approach is underlined by the fact that five graduates were able to begin useful work in systems design as soon as they took up employment. Two are now with GEC, two with Marconi Avionics and one with Texas Instruments.


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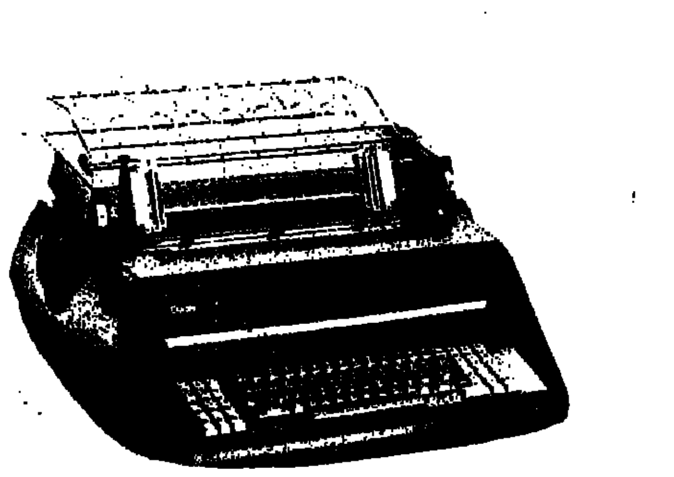

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# IMPACT OF THE MICRO

# COMPEC PREVIEW

# A South Sea Bubble about to burst?

## By Ivor Catt

**Compec 77 will present visitors to the Wembley Conference Centre with a vast array of computer products — processors, peripherals, terminals, etc. But one thing many of them will have in common will be microprocessor control.**

**The march of the micro continues apace and is opening up vast new markets for low cost stand-alone systems as well as extending the distributed processing capabilities of terminal equipment.**

**At the same time no peripheral manufacturer today can afford to ignore the opportunities offered by the microprocessor in terms of increasing the versatility of products and reducing costs.**

**These are some of the topics discussed in this special Compec Preview supplement, in which the overriding theme of the articles is the increasing significance of microprocessor technology.**

**On the lighter side Liverpool humourist Stan Bootle reports from the US on the microcomputer hobby craze. He also looks back on some of the crazier promotional gimmicks he has encountered over the last 20 years while assuming his other persona — that of computer salesman.**

**Computer technology specialist Ivor Catt is one member of the data processing fraternity who is most definitely not carried away by microprocessor mania and believes that the microprocessor is nothing more than a Chinese copy of the 1944 vintage Von Neumann computer. Here he explains why.**

TO determine the real value of the micro let us examine the underlying power struggles on which the microprocessor floats like a cork on a turbulent sea.

The traditional Von Neumann computer had a very small repertoire, essentially limited to the sequential processing of a list of data. However, in the same way as it would be possible with careful organisation and hard work to construct a public water supply system based on transporting individual thimbles full of water from house to house rather than by simply laying down pipes; or in the same way as it would be possible to build and operate fast motor cars with legs rather than wheels: so with careful organisation and hard programming work it is just about possible — though inconvenient — to make the Von Neumann machine do the various jobs we really want to do, such as avoiding air crashes, railway time tabling, sorting out car traffic jams, pattern recognition etc.

Computer hardware architecture having remained constant for 15 years from 1944 to 1959, a galaxy of programmers grew up around it who were skilled at making the best of a bad job — getting the intrinsically very limited Von Neumann list processor, which is grandly called the general purpose computer, to stumble its way through a broadening range of applications.

The lower echelons of programmers were similar to the clerks in earlier business enterprises, while the upper echelons busied themselves with the more philisophical aspects of how to make the best of a bad job.

All echelons were agreed that they could only optimise procedures if the machinery they used remained unchanged; and since they worked for and had best access to the customer, they had their way in stabilising the product.

It is worth emphasising that it was primarily the demands for stability from the programmer which led to the ossification of the computer for a third of a century.

Programmers are more or less totally ignorant of the possibility of other more powerful architectures using currently available hardware.

For example, 99% of programmers have never heard of content addressable memory (associative memory), a product which dramatically increases computing power but demands major architectural changes in the computer.

Long before the advent of the microprocessor, the Von Neumann computer had grown like Topsy into a dinosaur with more and more peripheral equipment patiently waiting on only one processor, merely because the 1944 vintage machine had only one processor.

As far back as 1966, for example, a large minicomputer reached the absurd stage of £250,000 worth of machine all waiting to file its material through one single, tiny processor comprising 50 packages x 16 logic boards, a total cost of some £3,000, or only 1% of the whole machine. This was like having one single policeman at the same time trying to manually control all the traffic lights at every road junction on London.

Still, the programmer lobby held onto the 25-year-old architecture of one processor and an increasing array of random access memories (RAMS) and peripherals, glorying in the way his procedural clutter could "control" such an absurd architectural dinosaur.

The only freedom left to the hardware manufacturers was on the one hand to make RAMs cheaper and smaller, and on the other hand to make the processor cheaper and smaller, culminating in the microprocessor, the "Case of the disappearing mill."

But cannot computer people see that the microprocessor is as inconvenient and absurd as a full grown man trying to ride a tiny two year old's bicycle?

Don't think that you will arrive at an advanced computer architecture by assembling a matrix of 1944 vintage computers, namely microcomputers, any more than you will expect to build a modern motor car out of an array of horses and carriages.

In the marketing of the microprocessor, an interesting pincer movement developed. The integrated circuit manufacturers appealed to the technology-free programmer over the head of the hardware designers.

They promised a hardware "advance" which would further reduce the cost, and therefore the significance, of hardware compared with software.

They promised that all the mysterious, complicated, expensive things previously done by special purpose hardware would in future be merely small subroutines time-shared onto the microprocessor, and come much more under the programmer's control.

It seemed that the microprocessor would make it possible to "program away" all the traditional odds and ends which got in the way of the programmer who had no engineering expertise — and which means almost every programmer.

It is worth mentioning in passing that few Computer Science courses contain any hardware — that is, they contain no science. Professors tell me that this is because they cannot attract entrants to the courses who know any physics.

Seminars on microprocessors turned out to be courses in elementary programming, and so were welcomed by young hardware designers and programmers nervous of their ignorance in elementary programming.

The experienced hardware designer could not argue against the microprocessor, because this would be interpreted as

- merely due to his fear of having his design territory usurped by programmers or
- meaning that he was too old to learn new tricks.

The breakdown of microprocessor systems would be attributed to obstruction or even sabotage by the rearguard of old designers, or resulting from their lack of design expertise. So manufacturers would be free to deliver a faulty product.

The inclusion of microprocessors in a system was implied to be a straightforward, trouble-free procedure. Teething troubles, when they arose, would be blamed on the hardware engineer by the microprocessor manufacturer and the programmer, acting in concert.

It was hoped that the microprocessor, supposedly trouble-free in the engineering sense, would finally break most of the remaining finger-tip hold that the "plumbers," or engineers, had on the computer business, with their "oil cans" and obscure engineering talk.

Now that the knives are out, I can muster enough courage to add my timorous voice to the criticisms of the microprocessor.

The microprocessor is the bitter fruit of an embittering process which extends back through the decades in what is now the long (third of a century) and pathetic history of computer science. It is a history littered with ignorance, professional dishonesty, lies, broken promises, frauds, shysters and South Sea Bubbles.

I write with bitterness because in 1967, with a Cambridge engineering degree, four years in the leading computer labs in the UK plus four years in one of the leading microelectronics labs in the US, and some impressive research achievements behind me, I was well placed to contribute to an exciting new industry which would marry the fast emerging, powerful capabilities of semiconductor electronics with a broad range of human and sociological needs, thereby creating a major, profitable industry. This did not happen.

My last post was in integrated circuit LSI Research and Development for a large US mainframe manufacturer. At that point I finally became convinced that the industry was going to lose its way, miss its explosive market potential (estimated by me at 10% of the Gross National Product) and instead meander into childish, small market trivia, like the hand calculator, and peculiar archaisms like the microprocessor.

I was hopelessly isolated, because virtually no one had the breadth of knowledge to be able to see or even understand where the computer art should be heading.

The result was that the industry flew off at a stupid tangent, and I left the industry to start a new career which would have more purpose and potential.

The young bloods who are today braying that the microprocessor is the greatest thing since the wheel are too young to know that the history of industry is littered with bubbles that burst, such as ternary logic which claimed that it was better than binary because three is close to e than two.

Like the microprocessor, none of these earlier bubbles stood up to a modicum of rational appraisal, so the fallback argument, "Everyone's going that route, so it must be right," was promptly brought into play.

The microprocessor must be admitted to be the biggest bubble of them all, a veritable South Sea Bubble which may suck us all in, burst, and leave little industry of substance surviving in its wake.

There may be a limit to the gullibility of the public and its willingness to pay hard cash for myth, glamour and hoodwink, even if the seller has managed to hoodwink himself as well as the buyer.

Now let me list a few of the major flaws in the microprocessor.

1. The microprocessor is a Chinese copy of the 1944 vintage Von Neumann computer. Its architecture makes no concessions to advances in programming, and also no con-

● Turn to page 24


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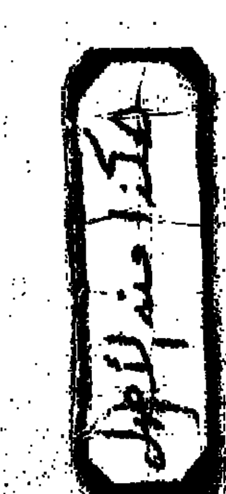

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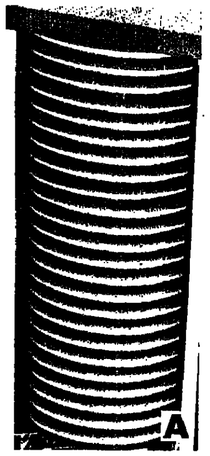
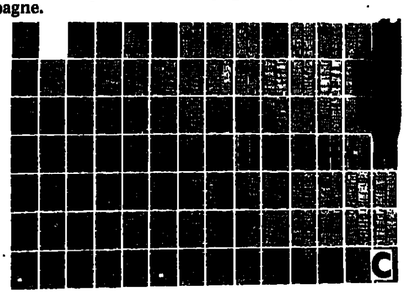


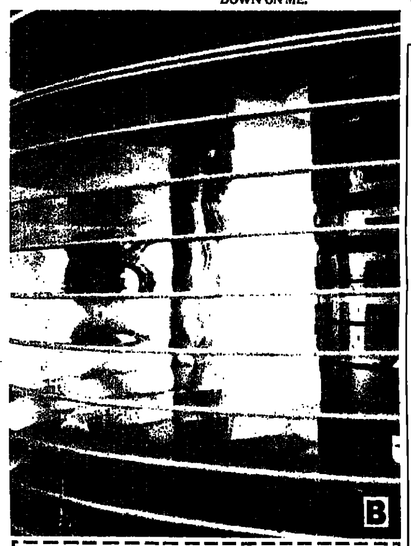

**IDENTIFY the equipment in the four pictures on this page and you could win a bottle of vintage Champagne.**

Each day at Compec next week (November 8 to 10) two bottles of Champagne will be given to the first two correct entries selected on CW's stand (U87).

A bottle of Champagne will also be awarded to the best badge slogan submitted on the entry coupon below.

The slogans should not be more than six words long and must, of course, have some relevance to computers, such as MACHINE CODE WILL RISE AGAIN, DISCS ARE SQUARE or MY COMPUTER GOES DOWN ON ME.






To enter the CW Champagne Competition you must be a registered Computer Weekly reader and you must hand in this form at the Computer Weekly stand at Compec. Postal entries will not be accepted.

The daily picture quiz prize-winners will be chosen at 4pm and announced over the public address system. The badge slogan winner will be announced in Computer Weekly and the prize delivered by mail

For the picture quiz you need only identify the type of equipment, (eg card reader, and not the maker or model). The first two correct entries drawn at random each day from those submitted during the day will win the prizes. Malcolm Peltu, editor of Computer Weekly, will choose the best badge slogan.

The judge's decision is final.

The equipment in the four pictures above are:

A .....

B .....

C .....

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My entry to the badge slogan competition is (not more than six words)

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Job function .....

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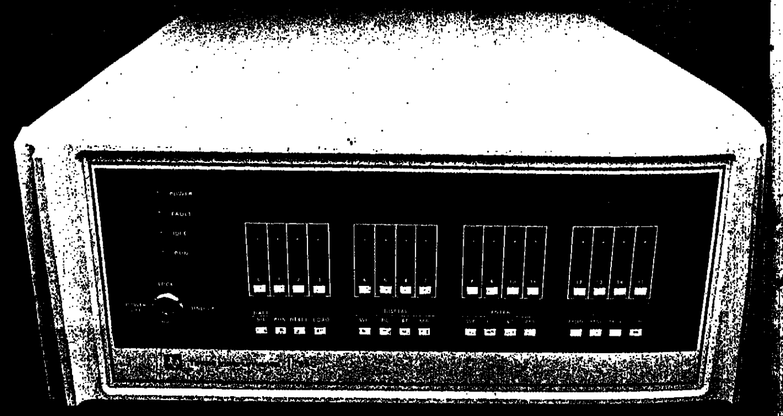
## 990/10 OEM minicomputers.



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The 990/10 minicomputer from TI brings superior value to both you and your customers.

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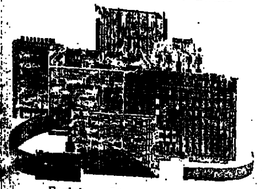
The 990/10 is the most powerful member of the 990 computer family. Its architecture provides features that give you maximum processing power for your money. Like hardware multiply and divide. A 16-level hardware interrupt structure. 16 registers arranged in a workspace concept. I/O that's directly programmable through the Communications Register Unit (CRU) and autonomously through a high-speed data bus. And bit, byte and word addressing of memory.



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**Built for system flexibility.**

In small or large configurations, the 990/10 design provides surprising flexibility for a small investment. The CRU, with up to 4096 I/O lines, reduces interfacing costs by keeping controller complexity to a minimum. The TILINE* asynchronous high-speed data bus can support both high- and low-speed devices and takes advantage of design simplicity for simultaneous data transfer between peripherals, the CPU and memory.

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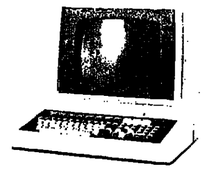

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As well as a range of standard peripherals, disc storage to 90 million 16-bit words and magnetic tape with 800 and 1600 bpi options are available for low-cost mass storage and back-up.

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# After the calculator...

## By Ian Skinner

**Housewives are joined by their wallet-carrying husbands during the January Sales . . . no, not to buy that £1,000 mink knocked down to 80 quid . . . but hubby will be after future series small business systems, at last year's prices, firmware included, for his boss . . . All a dream? Not so, says CAL chairman Ian Skinner, who predicts that computers will soon follow calculators into High Street stores.**

**It may even replace the family pet. Sorry, Fido.**

THE idea of electronic calculators on sale in High Street shops was as improbable to most people 10 years ago as the idea of computers in the same shops seems to be today.

Yet an objective look at the way the market is hurrying under the impetus of the micro shows this is bound to come, and come soon.

To contemporary eyes, several big hurdles seem to lie in the way of this move. They centre upon the degree of skill and expertise needed to sell, program and service machines doing a computing job, as opposed to a simple calculating one.

How on earth, for example, can a big chain of High Street shops possibly cope with the engineering support needed for a computer installation? And who is going to cope with all the programming?

Surely, also, the type of High Street sales assistant who can sell a calculator in a packet for £3.99 or a line of stationery isn't going to cope with the task of talking to a small business customer about his computing needs?

Even if the machinery itself can come down in size quickly enough, which nobody is likely to argue about, these difficulties seem to present far greater problems for High Street computer shopping than ever arose for calculators.

But a closer look at each problem in turn shows that none has any real substance at all. First, take the matter of engineering support. Most office equipment dealers today are backed by an engineering department with experience in the type of electro-mechanical machinery already on sale: that is to say, invoicing machines, electric typewriters and so on.

Now microcomputers are well known to be increasingly reliable, with the only area of possible frailty being in the electro-mechanical parts.

Circuit board replacement for micros will hardly present a great problem to High Street shop engineering people, and their present electro-mechanical knowledge will not take long to adapt to the electro-mechanical parts in micros, so there will be very little difficulty in the engineering support area.

In fact, there is even likely to be an improvement on present centralised systems, because local shop engineers will be able to give a service that is both fast and on the spot.

Second, the programming difficulty. The answer here is in the continuing development of packages which can be sold with machines.

Most mini and micro concerns — as I know from our own activities at CAL — have now built up such a mass of small user experience in all sorts of different fields that program package development has become quite a business within a business.

Continuing expansion on the program package market is going to remove almost entirely the need for specialised skills and time to be devoted to programming for tomorrow's customer in the high street shop's computing corner.

The third obstacle, lack of capable sales staff, has crumbled away in the course of my outline answers to the first two obstacles.

Highly skilled sales staff simply will not be needed so long as most High Street customers will buy standard machines and standard programs.

Another important factor that is often overlooked in this context is the growth of knowledge amongst users and potential users of all kinds about computing and its capabilities.

The High Street sales people will not need to spend hours explaining what computers can do any more than they now need to explain what electronic calculators can do.

There will always be, however, those customers who find they want something more complex than a single machine and the widest range of "off the peg" programs can cope with.

The sort of man, for example, whose stock system is simple, but who has 130,000 lines of stock in use. What little training the High Street sales staff will need must centre on identifying these people and passing them quickly into the hands of more specialised staff at regional offices or in associated DP specialist companies.

It could well become easier and cheaper for, say, a new district stores department manager to pop out to the High Street shop for a micro-plus-stock-package than to apply for his own terminal and program from head office's big computer.

All these developments seem to point to a tough future for any middle-range computer manufacturers who decide to continue developing and marketing their machines through their own structures.

The biggest computer firms will of course be safe for the time being in their own special markets, which the High Street micros will only touch at the peripherals.

But it is difficult to see many middle range concerns surviving the mounting pressures of the localised micros on their markets.

After all, this is exactly what happened in the calculator field, where the huge market which sprang up as prices tumbled gave rise to a whole host of firms marketing their own products.

A look at the calculator field now shows just how few have survived the High Street outlet impact on their business.

In case anyone thinks all these events are too far ahead to worry about yet, here's a final thought that may help to bring them into perspective. Microprocessor-based products have already been in High Street shops for some time with simple programs and engineering support that users find quite acceptable.

I'm talking, of course, of the programmed washing machines and micro-controlled cookers that have captured the home market without anyone bothering about distribution, sales or support problems at all.

See us at COMPEC'77 Wembley Stand L2 November 8th–10th 1977

# PDP11s with fungus compatibles

**Originals:**

Fungus is a company devoted to the supply of compatible modules and peripherals for PDP-11 and other mini computer Systems.
Fungus has been formed to manufacture and sell the range of PDP-11 compatible hardware which has been developed by a major mini-computer business systems house in the UK over the past 4 years. These units are software compatible with their DEC counterparts and we are now making them available for sale at a considerable saving to any PDP-11 user.
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# Intelligent terminals: future developments

**Taking an optimistic view of how intelligent terminals will develop into distributed processing is DAVID BONNY of Raytheon Cossor Data Systems.**

**He sees this development having far reaching effects on society and believes that intelligent terminals can provide the foundation for a money-less environment a lot sooner than most people think.**

AS data processing becomes more widely used, the interface to the DP system must move closer to the users and the DP service must be organised to match the structure of the organisation which it serves.

Thus we will continue to see the continued development and extension of terminal systems and the concept of distributed processing.

Large organisations such as the government are devolving with the aim of keeping processes and functions down at the lowest practical level. This frees the top levels to concentrate on the tasks only they can handle.

In the same way the large central DP systems should, and only need to, perform processing that must be carried out at the centre.

This philosophy becomes a practical proposition because the economies of scale are often defeated by the overheads of organisation, control, co-ordination and maintenance.

We are all aware that this is common to large organisations and large DP systems. Thus we see manufacturing organisations giving more autonomy to individual plants, insurance companies setting up regional offices and distribution companies creating specialised distribution centres.

It is obvious that the terminal is the key to the development of data processing in this environment and the evolutionary development of more powerful and flexible terminals will allow more effective systems to be implemented with less effort and in shorter timescales.

Although there are other types of terminal, the VDU and keyboard has proved to be the most effective and adaptable device for transaction processing and has pre-eminence over other equipment such as typewriter terminals and audio response units.

The advances of technology in the past few years have enabled resources to be placed in the terminal which cost and size had previously restricted to the mainframe.

The two elements of intelligence, namely processing power and memory, can now be provided in the terminal and the unit cost is the same as non-intelligent display systems a few years ago.

These resources have been used to provide functions at the terminal previously provided by the mainframe, such as storage of screen formats, validation of entered data and formatting of printed output.

At the same time, equipment originally intended for other uses such as remote batch terminals and data preparation systems, have had VDUs, local storage and communication facilities added.

We thus see the emergence of the multi-function terminal system allowing operator stations to be used for local data entry, interaction with the mainframe and local processing tasks,

The system allows these functions to be performed concurrently and can provide a choice of communication protocols to the mainframe. That is: normal terminal system for interactive sessions, remote job entry for batch data transmission.

In conjunction with the software to provide these concurrent facilities, the other major development has been software to enable the intelligent functions to be implemented without the requirement for programming.

All the processing carried out by a terminal on a particular transaction type can be specified at set-up time by a question and answer session at a terminal. In addition, supervisor functions allow for the control of files, batch communication with the host and normal utilities.

Now are these systems being used today? It is perhaps disappointing but understandable that the first uses of intelligence in terminals are to help the DP system do its job and are transparent to the user.

These terminal systems may also be capable of being tailored to fit the user environment more closely. It will not be sufficient to have a single size of display station and keyboard.

Thus having seen the development of the multi-function terminal, users can look forward to the provision of the bespoke system tailored to software and hardware terminals to meet their particular needs.

What technological developments are imminent or on the horizon, and what will be the effect? The evolution will continue with the introduction of new technologies. Storage will be on mini-diskettes, diskette discs and large disc storage modules for some time, but the application of bubble memory will accelerate.

Processors will become more powerful and multi-processors within systems will become common; systems already use satellite microprocessors for internal functions such as disc controllers.

The other major development that may come is the replacement of the keyboard with some other device, such as a voice recognition system. But, having replaced the noisy card punch, teletype and typewriter, do we want noisy operators?

These advances in technology and their application to business situations will provide the skills and experience to implement the dramatic far-reaching systems that will change society.

The money-less environment of electronic funds transfer system, with purchasing performed by direct transfer of funds from a bank account to the supplier's account and the travel-less environment, using terminals in home or office for video communications, library access and remote performance of some profession, are but two futuristic examples. Yet these could be nearer than most of us think.

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## By David Bonny

Thus the loading on central mainframe and communication lines can be significantly reduced by local format storage, local data validation and local print formatting.

Such systems are now being installed using intelligent terminals with diskette storage/disc storage where the transaction code determines whether the source of data and formats is the mainframe or local storage and whether the input data goes direct to the mainframe or to local storage.

A most significant additional benefit is the ability to continue work at the remote site in the event of a line or mainframe failure.

With experience, the facilities offered by intelligent terminal systems, can be more fully exploited by expanding the scope of the existing applications and adding new local applications, perhaps peculiar to that location.

The user with his individual requirement will no longer be a lone voice at the end of the corporate DP development queue. For example, because the terminal is now performing some of the local processing rather than being just a data input device to the mainframe, it can provide control and monitoring facilities of the procedures being processed, thus ensuring greater accuracy and consistent performance.

How will the use of these systems develop from today? Developments must be in the following three areas.

The DP terminal system must expand to be the office terminal system, and to do so will have to provide word processing facilities as well as data processing functions.

Initially word processing can be another concurrent activity, but as application boundaries are extended there is the requirement for word processing to form the "front end" of many applications.

Thus the quotation to the prospective customer contains the basis for order entry and a client's basic particulars contained on a BP file can be extracted for inclusion in any correspondence created by word processing.

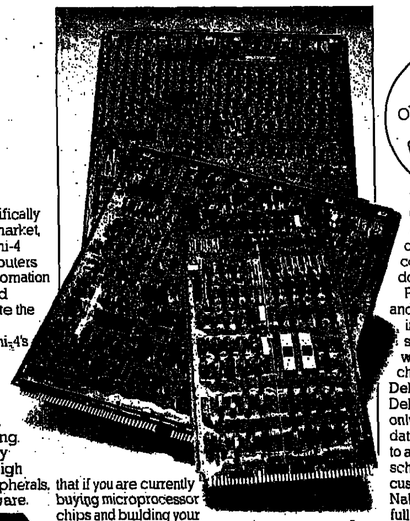
The intelligent terminal system must expand to become the multi-level system. Thus an organisation can have simple terminals at minimal size locations, intelligent terminals with limited storage (eg diskettes) at other remote locations and larger disc systems supporting regional area databases.

This concept applies equally well on a single site; that is a departmental system with other departments using the system via their own terminals.

The multi-function terminal system must also become a comprehensive communications system. The transmission of information both for data processing and word processing must become as simple and flexible as using the telephone. This is via a fully automatic exchange with remote extension dialling.

Data can then be transmitted up, down and across the organisation and links established with other systems and organisations. Clearly systems such as packet switching and Viewdata/Ceefax/Teletext are only tips of this emerging iceberg.


# The New Naked Mini-4 family from ComputerAutomation.



SEE US ON STAND NO. C10-C11 AT COMPEC'77

Designed specifically for the OEM market, the new Naked Mini-4 Family of minicomputers from ComputerAutomation sets a new standard against which to rate the competition.

The Naked Mini-4's offer more power for less money. Greater flexibility. Full compatibility through the range. Cheaper interfacing. Extensive memory options. Reliable, high performance peripherals. Outstanding software.

Total reliability.

Fast delivery.

**The LSI 4/10**

A full 16-bit half-card minicomputer, but so competitively priced that if you are currently buying microprocessor chips and building your own computers, you may now find it hard to justify the cost of your development effort. Four integral I/O interfaces are standard.

**The LSI 4/30**

The new mid-range minicomputer against which all future OEM computers will be compared. Twice as fast as the LSI 4/10.

**The LSI 4/90**

The most powerful computer in the new Naked Mini-4 range, and

twice as fast as the LSI 4/30. Ideally suited to high-performance, multi-tasking operations.

**Compatibility**

All the new mini-computers are fully compatible, both up and down the range!

Processors, memories and interfaces are fully interchangeable, supported by software which is also interchangeable.

**Delivery and Reliability**

Delivery is an average of only 30 days from the date of order, or planned to a guaranteed schedule for major OEM customers. And every Naked Mini-4 carries a full 12-month warranty.

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# Our man in Silicon Valley chip shop

**The computer hobby element at European shows such as Compec is growing. But it is still nowhere near the level of participation seen at the various US jamborees. Liverpool poet and folk singer, computer salesman and occasional contributor to Computer Weekly, STAN BOOTLE, writes about the Chippies and the development of the home brew cult.**

**After bidding farewell to Scouseland, Bootle immersed himself in DP, both commercial and academic varieties, before leaving for the US to work for the Logical Machine Corp at Sunnyvale, California in Silicon Valley, the heart of chip shop land.**

**In this light-hearted report, he discusses the US mania for hobby systems and recalls some of the more outstanding promotional lunacies at computer exhibitions over the last 20 years.**

I WRITE to you, dear fans, on a chilly October morning in Sunnyvale, having just slipped on an extra "I Caught Crabs at Fishermans Wharf" T-shirt as the thermometer dips to 70 degrees.

If only my six-in-a-bed mates back in Liverpool could see me now! What would they make of this semiconductor paradise, I wonder? "Half a conductor's better dan none," I hear a scouse voice within me. "We've got dem on de buses now. The driver takes de fares as you gerron. It's no paradise for 'im, like."

The microprocessor revolution will reach them all soon. The hand-held, four-function marvels at Boots and Woolies (have they hit the $2 barrier yet?) are but the thin edge of the slice.

The Chip Shops in San Francisco are selling 16K RAMs for $80, and Basic interpreters for $20. One window advert says, "Logos word-processing at burger king prices".

Personal computing, they call it. There are more home hobby computing magazines on my local newstand than journals devoted to motoring and hi-fi combined. Personal DP is replacing cars and stereo as the one-up-manship party-piece.

"What do you drive now?" "Oh, I drive a pair of Helios-2 discs with a voice-coil device. Only 750K but terrific access time. I traded in my dual-cassettes last month. . . ."

"Really? I've just splashed out on a CDC cartridge: 5.3 Megabytes, you know; lot more than I really need but I'm getting into Snobol. *Fantastic* language but it simply eats up core. Those DP turkeys at the office, struggling along with a 360/40. They used to pull the wool over my eyes . . . now they're all simply queuing outside my garage to debug their silly little Cobol routines."

Some say that personal computing is just a fad like trucking. For the uninitiated (or Limeys as they call them here) trucking means driving a chunky, masculine goods vehicle when everyone knows you don't need the freight carrying capacity and that you have a couple of Lincolns backstage for the quieter trips.

Bank presidents can be seen, proudly commuting to the bank in Toyota pick-ups. It is an extension of the denim-suit, image, a re-un-inverted snobbery. My own ambition is to arrive at the office in a 300-ton low-loader complete with police out-riders.

Others claim that personal computing promises (threatens?) a revolution in the socio-politico-economic fabric on a par with sliced bread or Caxton's letraset. The relevance of this so-called craze to the so-called traditional DP scene is already unfolding.

At this year's NCC exhibition in June at Dallas, the expected attendance figures would not have been achieved without the bus-loads of Chippies who poured in to see the byte shop stands.

My own company (here beginneth the commercial) has been successfully selling Adam, the first "natural language" business system, for 18 months or so, and we know a thing or two about the de-mystifying Gospel. Adam uses a very powerful CPU to "protect" the user from the monsters lurking in the syntactic jungle.

The typical personal computer kit cannot yet offer this power in the hobbyist price range, although some well-lined individuals have indeed bought Adams just as they ungrudgingly acquire their personal Rolls-Royce Corniches. In fact, at $35,000.00, Adam is nearer to your Mercedes 450 SEL.

The cost-curve in ICs obviously promises, in time, the in-home database mismanagement system.

We come back (forgive the boring analogy) to the car and the revolution in mobility, or, rather, *evolution*, since the Model-T Ford, initially, was rather like the electronic TV games gadgets.

To echo Brecht's "Erste kommt die Fressen, den kommt die Moral"; once a society has the "bread" and the morality therefrom, you can then sell guilt-less leisure devices.

Just as the early joy of being mobile evolved into an unquestioning reliance on mobility, the plug-in TV games market will grow into some form of personal data-handling system, the same mix of fun and necessity as the car.

On my deskette lie six brochures promoting DP exhibitions to be held this year. So, in the next three months six marketing events of varying degrees of extravaganza will be mounted. The venues range from Los Angeles to Birmingham, Warwickshire.

Phrases such as "practical, problem-solving expositions", "leading-edge information management technology" catch the eye. Is "leading-edge" sharper, more advanced than "State-of-the-Art"? The format of combined conference talk-ins and manufacturer exhibitions seems familiar. A half-remembered BCS show in Brighton, in 1955 or 1956, established this pattern.

The talking-point then, I recall, was whether the new-fangled electronic gadgets could match the reliability of well-oiled Powers-Samas cables. This year, a major industry devoted to maniuplating invisible symbols at sub-molecular levels beyond the user's comprehension, will increase its hypnotic power over every possible sector of business.

Having looked on exhibitions from both sides now, I wonder what masochistic, nay, incestuous, forces perpetuate this method of marketing.

My own personal survey, asking why a manufacturer should expose his delicate wares to the most hostile environment imaginable (viz, doubtful power supplies, inebriated operators, pro-static carpets, look-alike neighbours, sub-optimal lead-times, anarchic visitors, expensive unions, malevolent competitors, mis-printed catalogues, inaccessible locations and over-booked hotels, to name but a few) brought the usual nul-responses: "We are far too busy preparing for the exhibition". "We cannot afford to miss this one, since our rivals are there".

"We have a highly-paid exhibitions manager"; "This is positively our very last exhibition appearance. Next year we plan a private gathering for 400 of our closest friends at the nearest Holiday Inn."

Having gotten (sic) the Plumpen into the aisles, how do you pull them on to your expensive stand? One year, I remember, the star attraction was a model railway layout on the English Electric KDN2 stand. The display was relevent to a real live rail computer application, but were the thousands of visitors all potential customers? You can almost feel the angst of the computer salesman.

"Yes, Sir, I realise that you manufacture blackpuddings, a favourite dish of mine, if I may say so, and here we have our KDN2 automatically marshalling goods-trains, yet I put it to you, that, with suitable modifications to our algorithms, we could, no doubt, automate your re-production line, food-mix equations, invoices, accounts receivables and, assuming you actually pay

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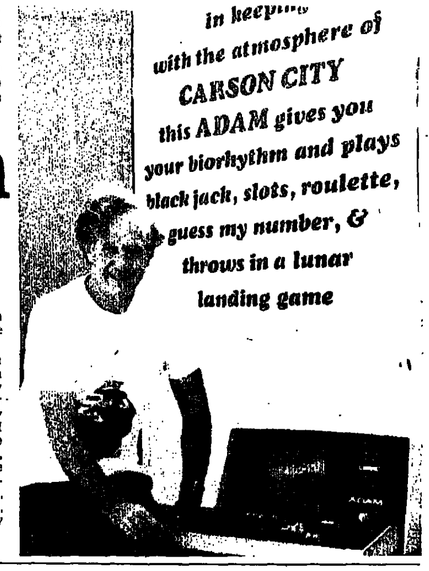


# A great deal for the future from ComputerAutomation.

We're still expanding so fast that we need people at all levels of the organisation, and for all three Divisions of the company:

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We know how bright our future is, but if your career seems short on long-term prospects, look in to see us in the Soho Room at the Wembley Conference Centre at any time during Compec from November 8. We are also exhibiting on Stands C10 and C11.

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# Why suppliers will dictate the future

**The mini is now at the leading edge of technology and in hardware terms this does not necessarily mean substantial changes to architectures.**

**So says DAVID BUCKINGHAM, the UK sales manager of Digital Equipment, who gives his views on the changing role of the minicomputer.**

FROM early applications within process control and general research, the role of the minicomputer has become a major consideration in corporate organisational development.

Fundamental developments in technology have coincided with equally far-reaching changes in the way organisations operate. Economic influences in particular are encouraging the use of more and smaller computers in organisations, while at the same time minicomputers are becoming widely available at prices which are relatively very low.

It has been the minicomputer supplier who has provided the main thrust in technological advancement that has sent the price of computing diving downwards. All indications are that this trend will continue.

The cost of developing a mainframe system — of putting together a large-computer product on the manufacturer's part, and of implementing such a system by the user — is a major factor, because both have to think in extremely long timescales to write off that investment.

Many mainframe installations now are unable to shake free of software investment that dates back 10 or 12 years, and find themselves running face-lifted but essentially outdated systems at a time when the costs of rewriting are rising inexorably.

By contrast the minicomputer vendor and his customers do not have that dead weight of development — or at least not to anything like the same extent.

The unit cost of the product is so much lower and the production volumes substantially higher.

The initial requirement for system software was fairly low, with users keen to write much of their own, and the heavy investment subsequently made in sophisticated software by the mini suppliers has been covered by a wide customer not requiring costly support.

The result is that the mini is now at the leading edge of technology. In hardware terms, this does not necessarily mean substantial changes to architectures.

It makes sense to retain a flexible bus structure and a basic internal operation which will allow the user to run his programs on different models in the same computer family.

The real changes involve speeding the execution of those programs while simplifying the programmer's job and giving him (or her) more instructions and more I/O options. The major advances in this area have been in memory management and machine instruction sets.

For a variety of reasons the 16-bit format is a good standard for minis. Devoting part of a 16-bit instruction to indirect addressing via registers can extend the range of addressable locations, although it obviously cuts down the amount of space left available for the instruction and data in the word.

But this approach is frequently used to allow a mini to address 256K or 512K bytes. An additional solution is the memory management unit which can enable a powerful minicomputer to address 2 Mbytes.

Another important innovation is high speed cache memory. On the Digital Equipment PDP 11/70, for example, this is 2K bytes of bipolar store with a cycle time of 240 nanoseconds.

It is loaded serially from main memory with the contents of locations nearest to that last referenced, and for around 93% of memory accesses the cache contains the location required by the program. That speeds up program execution quite impressively.

Software trends tend to be evolutionary, with operating systems and file management enhancements developing from previous implementations.

One reason for the extra addressability of modern minis, however, is the increased scope that the new operating systems provide. When the system software offers few facilities, you need little memory space.

And there are some radical developments in executive software, particularly in terms of real-time languages — Coral being heavily promoted, not least by the Government, as the best of a good bunch — and in database and data communications.

There are sound economic and technological reasons for the trend to "distributed data processing". The key concept is the use of resources.

Placing minis throughout an organisation actually matches the way most of them function, while at the same time the local user is able to customise the system to fit his requirements without losing touch with central control.

The result is likely to be cheaper than a mainframe plus terminals solution if only because the mainframe can be smaller and the communications line usage lower.

Enhancing the local mini will be cheaper than upgrading a mainframe, and the distributing processing approach also allows a significant degree of security in the event of breakdowns and stoppages.

This trend fosters the spread of minis and encourages the development of applications-oriented software like database managers for the local installations.

The distributed approach can flounder without an appropriate core, however. That "core" might be a large central mainframe complete with large and complex teleprocessing control systems; or it might be a sophisticated network controller.

Networks represent a major development in minis. Essentially they allow interprocessor communications between different installations in nearly any kind of network.

They handle the protocols and scheduling, and they are not restricted to the "star" type of system based on many a large central machine.

Important to network development is file compatibility between processors in the network, and here the development of compatible database and file management software will be important.

Digital Equipment's approach has been to standardise on Codasyl-format database software, so that files set up on and managed at a DECsystem-10 will be fundamentally the same as those maintained by a PDP-11. In this way files can be referenced by and interchanged between installations in the network.

Distributed processing ideas are at the centre of the fastest-growing area of the minicomputer business, the commercial market.

One of the great attractions of the minicomputer is that the same basic configuration can be used as a stand-alone data processing system to look after the accounting of the small businessman and as a local processing node in a network to handle departmental jobs in a big company.

In the second major area of minicomputer activity, the industrial and process control sector, the use of local data acquisition and control systems with their own built-in minis or microprocessors on-line to a central controller is well established.

At the lower level, of course, the major factor is the rise of the ubiquitous microprocessor. The resolution of the photoresist masks used in the manufacture of LSI has hitherto posed a problem to further miniaturisation but it now looks as though chips one third of a micron thick are feasible. There is much talk about a Mbit ROM chip being in production by 1980.

The significance of semiconductor developments is that costs will depend not on the content or function of the chip but on the scale of production.

This will alter our whole attitude to hardware design, i[illegible]

● Turn to page 27


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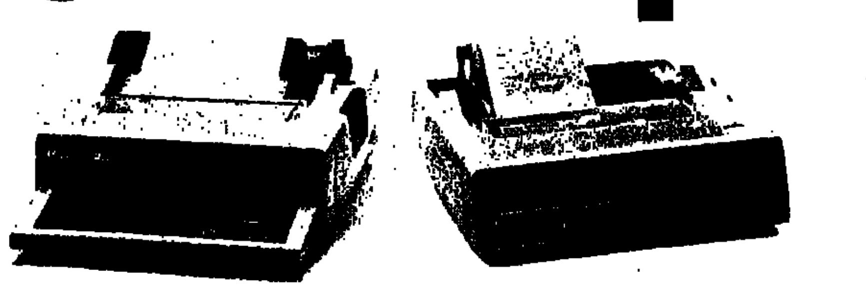

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# Advancing the design of print devices

## By Alan Jones

**Most printers on the market are updates of older concepts. But the latest generation will have a micro for a heart.**

**This has the advantage of giving more sophisticated control over output at a lower cost, cheaper maintenance and simplicity.**

**Alan Jones, the engineering director of Dataproducts, is currently working on the designing of core memory systems and microprocessor-controlled high speed line printers. He had a similar position at Plessey.**

IN a time of rapid technical change, even traditional electromechanical devices such as the printer are changing, and the microprocessor is contributing substantially to the design of the latest generation of print devices.

Broadly speaking, micros are putting in an appearance to control the mechanical movements of drum and band line printers and to rationalise the movements of the print head in bi-directional printers. The microprocessor also enables the printer designer to incorporate more intelligence into what has traditionally been a rather "unintelligent" inhabitant of the computer room, by extending the range of features available to the user, and to speed up maintenance and fault diagnosis in order to reduce down time.

In the first place, the microprocessor is attractive to the peripheral designer, simply because the use of structured logic devices makes the job of designing advanced features an intellectually manageable problem. The processor itself and its program enable the design problem to be broken down into comprehensible sections.

The type of microprocessor selected for a particular peripherals application will depend on a number of factors: the functions that have to be generated; the speed of the processor in relation to the speed of the operation of the peripheral device; the technology that is currently available: and economic considerations such as ease of custom modification.

In the case of printers, very high data input rates may be involved — in the order of 500 Kbytes per second — and to accept data at this rate is not possible with the current range of mainstream 8-bit microprocessors such as the Intel 8080 or Motorola 6800, without some kind of direct memory access. In our current range of printers, we have, therefore, developed our own bit-slice approach to provide control, comparison and test capabilities

In general, controlling the mechanical aspects of printing, such as actuating the print hammers, is a slow process limited by mechanical inertia, while the inputting of data is a fast process, as is comparing the present position of drum or band with the current character to be printed. Using a bit-slice approach provides a processor fast enough to cope with the two high speed components of the printing process.

In either a drum or band line printer, the fonts move rapidly past the hammers and the control problem is simply that of knowing which character is opposite which hammer before the hammer is fired. Since the characters are moving rapidly past the hammers, and since the whole of the line that is to be printed has to be scanned during the time that one character passes the hammers, then a very fast processor is required to compare the contents of the input buffer with the current position of the mechanical components.

Data is written a line at a time into the input buffer and is printed during a single passage of the character repertoire. This means that as each row of characters is presented to the hammers, the "A" line, for example, the contents of the input buffer must be examined for the presence of that letter. This comparison process could, in principle, be done in parallel, but would require a vast amount of electronic circuitry to do so. On the other hand, performing the task serially adds a dimension of complexity which the structured approach of the microprocessor is ideally suited to.

The structured logic approach means that the designer is able to separate the definition of his control system from its execution: that is, to separate the electronics hardware itself, which is invariant, from the program, which can be modified at any time in order to accommodate new features, such as changing the character set.

The second important benefit of using microprocessors is that they simplify the maintenance problem, since it is easier to troubleshoot structured logic than random logic and it also gives stability and uniformity of spare parts. Fault diagnosis is considerably simplified since it is built into the program.

On the face of it, the use of micros in many applications would be justified by cost, but in practice the economic factors are considerably more complex. It is not possible for the designer to justify using the micro simply by reducing the component count in his control circuits, since the cost of software development and documentation must be taken into account.

However, it is still possible for the micro to give economic advantages *overall* in terms of reducing failure rate, increasing reliability, making troubleshooting easier and so on. This is important because the cost of an electromechanical peripheral to the user involves more than simply the purchase price. It is the total "cost of ownership" which must include running costs and losses due to downtime, and it is in this sense that the micro may be economically justified, rather than in direct reduction of manufacturing costs.

Equally important, from a manufacturing point of view, is the ease with which further features can be added to a micro-controlled peripheral simply by expanding the program. An example of additional facilities of this kind is on our band printer where the operator is able to change the typeface but does not have to "tell" the printer, since its program is able to detect the change. In a conventional random logic approach, the operator would have to indicate the change by operating switches.

The flexibility of programming also enables the designer to build in much more sophisticated fault diagnosis routines, enabling the printer to diagnose itself. Conventionally, a printer will have a number of lamps which indicate fault conditions in the ribbon, paper feed, and so on. Using the microprocessor approach has enabled us to incorporate a hexadecimal display in our new generation of printers which indicates the location of the error enabling the operator to refer to a list of possible fault conditions to get a much more detailed breakdown of faults.

Since a major design objective with peripherals of the printer type is to have the machine "off line" as little as possible, more than half the program has been devoted to this kind of checking.

Another way in which the microprocessor is assisting the perepherals designer is in the development of printer technology itself.

Band printers are becoming increasingly popular because any irregularities in timing show up as horizontal spacing variations between characters and this is thought by many to be more acceptable to the eye than the vertical irregularities produced by timing inaccuracies on a drum printer — a drum, of course, rotates in the direction of the vertical paper feed, whereas a band rotates horizontally, at right angles to the paper feed.

While the spacing of letters on a drum can be made to line up with the spacing of hammers (10 characters to the inch) it is not possible to put the letters on a band so close together, and this gives a kind of "vernier effect" where only certain characters on the band will be opposite a hammer at a given instant. Controlling the firing of hammers under these circumstances is much more complicated than on a drum and the processing capability of the micro provides a simple solution.

In some ways, this problem is a classical example of the way in which the micro is assisting in the development of electromechanical peripherals, since the general philosophy of the peripherals designer is to simplify the mechanical components as far as possible by taking advantage of the lower cost and simplicity of electronics.

It becomes possible to have more and more sophisticated control at lower cost, because the cost of extending the controlling functions is merely the cost of adding more memory.

Normally, for example, the sequence of characters on a drum is arranged in ascending numerical ASCII order, so that an electronic counter can keep track of the current drum position simply by keeping sequential count. A few applications might demand that characters be arranged in some non-ASCII sequence and such variations can easily be accommodated by reprogramming.


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The all-singing, all-dancing computer show takes place, appropriately enough, in the Wembley Centre — scene of such nights of glamour as the Eurovision Song Contest ... where the songs only sounded as if they were written by a computer.

# The all-singing all-dancing product line-up

## By Keith Jones

THE show that has become the biggest annual event for UK computer equipment suppliers and buyers opens its doors next week as Compec 77.

Bigger than ever, this year's Compec will see about 140 firms demonstrating their wares over the three days of the show, starting November 8.

As with Compec 76, the venue is the Wembley Centre which was only just completed in time for last year's event. Since then it has been the impressive setting of numerous extravaganzas, including the Eurovision Song Contest.

The all-singing, all-dancing product line-up will include systems from most of the leading minicomputer suppliers as well as a formidable collection of terminals, VDUs, printers, disc and tape drives and other media.

And this is more or less the order in which this preview of Compec 77 categorises the products being shown.

Flying the flag for the UK minicomputer industry will be **Digico**, which will illustrate the "start small and grow large" theme of its stand by placing its M16E single terminal floppy disc system next to the MTS 16E.

This configuration can be upgraded to have two Megabytes of main memory, 270 Megabytes on disc and up to 32 terminal users. One of the main features highlighted by Digico will be the system's hardware memory management paging unit.

Interactive ANSI 74 Cobol will be the star attraction on the stands of two of the US-based minicomputer manufacturers at the show — **Data General** and **General Automation.**

Data General will run it on the CS/40 commercial system which it launched earlier this year. Five display terminals on the DG stand will be used to demonstrate interactive data entry using the package.

Interactive Cobol is the main feature of the 440 Data System which General Automation will be exhibiting for the first time in the UK at Compec.

The 440 DS is spearheading a new offensive by GA on the commercial systems market and is configured around the 16/440, the top end machine in GA's line-up of minicomputer hardware.

Also receiving its first showing at a public exhibition in the UK will be the Naked Mini-4 family of OEM machines from **Computer Automation.**

These include the LSI 4/10. This is a complete 16-bit computer on a half card providing minicomputer performance at microcomputer prices, according to Computer Automation.

The emphasis on the **Prime** stand will be far more on software than hardware. Prime will be demonstrating its Primos time sharing operating system, which is used by universities and commercial bureaux, its multiple index direct access filing system, Midas, and its Codasyl complaint DBMS.

Languages on show will include Fortran, Cobol, Algol 68, Basic, Coral and Gino F. The whole lot will run on a Prime 300 processor linked to four video terminals.

Three packaged minicomputer systems are making their debut at Compec on the **Harris Computer Systems** stand. Called the 115, 125 and 135 they are based on enhanced versions of the existing Harris Series 100 computers. The main software exhibit will be Vulcan.

This is described by Harris as a priority-structured, demand paged, multi-programming operating system which concurrently supports multi-level batch processing, interactive terminal time sharing, transaction oriented processing, multiple remote job entry and real time operations.

Next door to Harris Computers its sister company, **Harris Communications**, will show the latest development of its 1600 terminal system. This adds IBM 3270 protocol capability to the local processing and RJE capabilities of older versions.

In addition, Harris will demonstrate its direct replacements for 3270 equipment, the 8171 and 8181 interactive terminal systems. Harris added these to its product range when it took

● Turn to page 23


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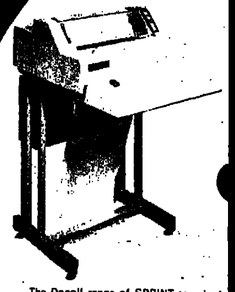
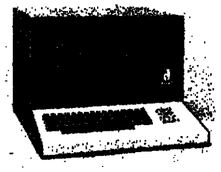


The Dacoll range of SPRINT terminals offers users a selection of operating modes which cover a wide range of printing and data communications applications. High speed bi-directional printing combined with excellent quality of print is extended by a unique range of options. Options vary from a choice of printer width and matrix size to the use of micro processors



The Dacoll 240 series visual display units offer users a choice from a simple teletype compatible unit to a sophisticated cluster system operating in multiplex mode down a single line. Printer output, page/roll mode, blinking, protected field, inverse video, cursor addressing etc. are all available. Software routines allow protocol emulation of U100, ICL 7181, IBM 2780, etc. Transmission is synchronous or asynchronous.

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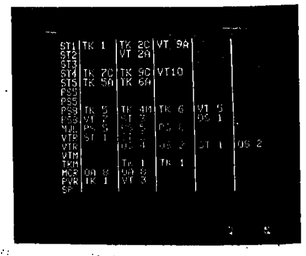

Video display is the last link in the plant/processer/controller chain. The Prowest range includes fully professional RGB colour and monochrome units; it offers the best possible video solution to your display problems. And because Prowest is a name long associated with video display and switching technology you're assured of high reliability and experienced technical support. Worth looking into. Prowest data displays from EMI.

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## Dinner for two prize

**A candlelit dinner for two in an expensive London restaurant is the prize in a competition devised by Panasophic for the Compec show.**

**One of the main software products being promoted on the Panasophic stand will be the company's Panvalet program management and security system for IBM users. Visitors will be given detailed information about the package and asked to make an intelligent guess at the number of source statements. The nearest estimate wins the prize.**

**Another attraction on the Panasophic stand will be a live demonstration of its Easytrieve file retrieval package.**

# Trivector systems lifts micro concept into the mini range

● From page 22

over **Sanders Data Systems** early this year.

Terminal sales are becoming increasingly important to minicomputer manufacturers and the industry giant, **Digital Equipment**, will devote a large part of its stand to showing off some of its leading terminal products. These will include the LA 36 DECwriter II, the LS 120 DECwriter III, a 1200 baud unit, and the VT 52 graphics display terminal.

DEC's only system demonstration will be of the PDP-11 VO3. This disc-based microcomputer configuration was launched in September and costs £9,000.

The main new product on the **Hewlett-Packard** stand will be the System 45, a powerful desk-top computer with a full-sized graphics display sitting on top.

Features include a RAM expandable up to 62K bytes and 98K bytes of ROM holding an enhanced version of Basic. H-P will also show off its H-P 1000 commercial system running various business administration applications.

**Computer Aided Systems (Sales) Ltd**, Compass, an established DEC systems supplier, will be using Compec to launch a UK designed and manufactured processor.

This can have between four and 128K bytes of directly addressable memory and is supplied with Computer Aided Business Language, CABL.

According to Compass this is easy to use and offers features never before available on a computer of the size of the Compass machine.

An existing UK designed computer, the Arcturus 18D, will be exhibited by its manufacturer, **Leigh Data Systems.** Warehouse control, automatic test equipment and research/laboratory work are some of the application areas listed by the company for the 18D.

In addition, Leigh Data Systems will introduce a Canadian built desk-top computer at the show. This is the MCM 800 which is optimised for APL and comes with a powerful virtual memory operating system allowing a workspace of up to 256K bytes.

A US systems house, **Mini-Computer Systems**, which is now established in this country through a major contract with Shell, is to take a stand at Compec to demonstrate Micos.

This is a configuration based on the Data General Nova 3/12 processor and comes with a test file management system called Factfinder and Mtam, Micos Telecommunications Access Method. This enables Micos to communicate with all manufacturers' computers, according to MCS.

The line-up of microprocessor-based systems at Compec will include something completely new from **Trivector Systems.** This is a multi processing system configures around three Zilog Z80 chips.

These are interlinked as a master and two slaves and enable three tasks to be undertaken simultaneously — something which lifts the micro computer concept well into the minicomputer range, according to Trivector.

Two Intel 8080 based systems will be the main exhibits on the **Transdata** stand. The CX400 general purpose systems come with twin 8080 processors, one for customer programming in assembler or Basic with a memory expandable up to 32K bytes, and the other for diskette housekeeping.

The CX400 can have up to four diskette drives. The other Transdata system is the Model 309 intelligent storage system for local file management and test editing and store and forward communications.

The **Jacquard** J100 video computer, which is built round a 16-bit microprocessor, will be one of the main attractions on the **Computer Ancillaries** stand where it will be shown running commercial applications like stock control, invoicing order entry, payroll and word processing.

A standalone business system costing £7,500, including software, will be the leading exhibit on the **Compelec** stand. The system is configured around an Altair 8800B microcomputer with 40K bytes of main memory and other hardware features include dual floppy disc drives and a DECwriter terminal. The software can handle payroll processing, VAT calculation and file management.

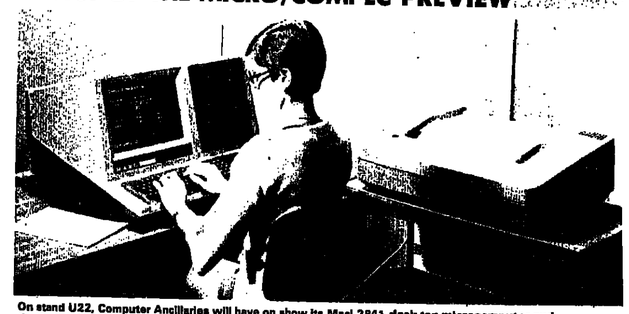
Two microcomputer systems being demonstrated for the first time at a UK public exhibition will be the Imsai 8080 and the Cromenco Z2, both on the **Comart** stand.

The Imsai machine will be shown running a diskette version of Basic, while the Cromenco Z2 will be linked to the TV Dazzler.

This is a colour graphics module which enables a standard TV to show business and technical graphics. Cromenco will also exhibit a 32K byte static S-100 compatible memory from **Dynabyte** which can be supplied burnt-in for £790.

Sharing the Comart stand will be **L.P. Enterprises**, which describes itself as an importer and specialist distributor of microcomputer magazines.

A new range of microcomputer modules manufactured by the Norwegian firm, **Mycron of Oslo**, will be exhibited by their UK distributor, **Euro Electronic Instruments.**



On stand U22, Computer Ancillaries will have on show its Msai 2841 desk top microcomputer and the Jacquard J100 video system.

The Mycron range includes memory modules, interfaces and opto-isolated process automation I/O modules.

A program development package called Microsim for the Intel 8080 and other microprocessors is being promoted by **Pactel** at the Wembley show. Developed by Pactel and consultants, **D.M. England and Partners**, Microsim is aimed particularly at the first time user and, according to Pactel, the documentation is easy to understand even by those unfamiliar with the complexities of micro technology.

Amid the dazzling array of display terminal equipment at Wembley will be two offerings from Univac in the intelligent area — the UTS 700 and the UTS 400 (see photograph on page 24). The latter can be used by the print and publishing industries as part of Univac's Graphic Text Management System.

The main feature of the **Honeywell** stand will be an "office packaged" Level 6 minicomputer, otherwise known as the Smart Desk (see picture on page 26).

This powerful terminal system is designed to fit into Honeywell's Distributed Systems Environment, (DSE) and can support up to four operator display stations. On the same stand **CII-Honeywell Bull** will show a range of OEM disc drives and printers.

Distributed processing will be the theme of the **Raytheon Cossor** stand where a PTS 100 intelligent terminal system will be shown handling local data editing, storage and retrieval.

● Turn to page 24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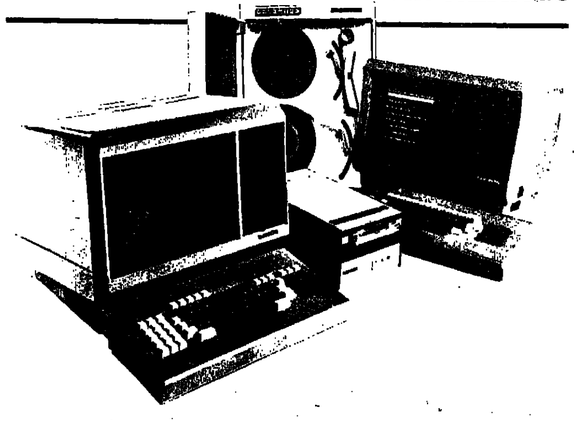

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IMPACT OF THE MICRO/COMPEC PREVIEW

● From page 23

# *Intelligent terminals lead the way in comms*

The other main attractions will be a demonstration of Tracs, the **Thompson Holidays** real time reservation system. The PTS 100 will be linked online to the Thompson computer centre along with 140 other PTS 100 displays all over the country.

**Incoterm** will demonstrate the latest remote data entry software for its intelligent terminal equipment by using examples from actual installations.

New products on the **Delta Data Systems** stand will include the Delta 6500, a programmable terminal cluster with up to eight VDUs, two printers and six floppy disc drives. The 6500 can communicate with a remote IBM mainframe in 3780 mode or by TTY protocol and can be supplied with Fortran and a text editor.

Designed especially for text editing is another new product being unveiled, the Delta 4300. Special features include the ability to define a block of text for searching, deleting, copying and moving.

Display terminal equipment built by the Norwegian firm, **Tandberg**, will be exhibited at Wembley by **Farnell Instruments** and will include the TDV2114 and TDV2116. These can be used as clusters compatible with IBM 3270 line protocol and as IBM 3741 compatible data entry systems.

The line up of graphics display systems will include what **Tektronix** describes as the first of a new generation of computer based systems combining both refresh and storage display techniques.

This is the 4081 which couples dynamic, selectively erasable picture manipulation with the ability to display large amounts of graphics and textual information without a flicker, according to Tektronix. It will also show its compact 4051 desktop system.

Pride of place on the **Calcomp** stand will go to the IGT 100 interactive graphics terminal, the forerunner of the interactive graphics system currently being developed by Calcomp.

A three way split screen is one of the most important features of the IGT 100 which will be shown alongside some of Calcomp's plotter and digitising equipment and OEM memory products.

Refresh vector graphics under minicomputer control can be seen on the **Terminal Display Systems** stand in the form of US-built Megraphic 500.

This is configured around a Data General Nova 3 and provides features like selective erasure of points, vectors and characters without affecting the remainder of the character. TDS will also show the Micrographic colour graphics terminals and the Regent 100 and 200. These are the first two of a new

**Pester Program Bug**

**This and the cartoon on page 26 came from the Colossal Computer Cartoon Book, published in the US by Creative Computing Press of New Jersey. It is available in the UK from LP Enterprises (stand L64 at Compec).**

teletype-compatible display series from **ADDS**.

A video terminals system, the Compucolour 8001, with an 8 colour graphics VDU, a microcomputer and disc store will be demonstrated by **Techex**.

The collection of low cost VDUs at the show will include one costing £750. Called the Elite 1521A it is built in the US by the **Datamedia Corp** and will be shown at Compec by **Mellordata** along with other Datamedia products.

These include an APL/ASCII display terminal, the Elite 1520, and microprocessor based units offering text editing facilities.

A 16-bit microprocessor forms the heart of the main feature on the **Lynwood Scientific** stand at Compec. This is the GD-1 display which can be programmed to meet users' needs without hardware modification.

Major OEM display supplier, **Hazeltine**, will be publicly launching its low cost 1500 range at Compec 77.

Features of the 1500 include a 1,920 character display showing upper and lower case character formed from a 7 x 10 dot matrix. Versions offering buffered editing will also be shown.

A range of VDUs that have been redesigned to lower costs will be introduced at the show by **Newbury Laboratories**. These are the Model 7000, a less expensive version of the Lynwood 7001; the Model 7002, which is the same as the existing Lynwood 7002 but comes with a numeric pad for the same £640 price: and the Model 7008/9.

Another UK display manufacturer at Wembley will be **Cifer Systems** of Melksham, Wiltshire which is showing off a group of terminals that range from simple teletype compatible units to a full test editing terminals. This is the 224P which provides tabbing, data field protection and a printer port as well as line or page editing.

Making its debut at Compec will be a low cost microprocessor based VDU designed and built by **Pericom**. Called the 6801 it features what Pericom calls a personality module which allows the user to specify all control codes to be compatible with his own software.

Suppliers of data communications equipment appearing at the show will include **Racal-Milgo** which has taken "Network Management" as the theme of its stand.

Network management software will be run on Racal-Milgo's System 180 Network Diagnostic Controller which can monitor, test and reconfigure modems, telephone lines and digital interfaces from a central location.

**Computer and Systems Engineering**, Case, will be introducing a new modem at Compec which it considers to be revolutionary.

Called the 430/34, it is designed to give the time sharing user dial-up operation at 120 characters per second using simple, teletype compatible printing terminals or VDUs.

Data communications network monitoring equipment manufactured in the US by the **Codex Corp** will be featured on the Cole Electronics stand.

● Turn to page 26

**Visitors to the Univac stand can check out the company's claim that its UTS remote batch terminal shown here has an operating system comparable to those found on large systems.**

# South Sea Bubble

● From page 13

cessions to the peculiarities (advantages) of semiconductor technology.

2. In 20 years' time, the computer industry will probably look back on parallelism as a temporary phase in computers. Microprocessors are archaic (1960 vintage) in that they are fully parallel.

3. The disadvantages of parallel working are dramatically illustrated in the microprocessor, with its absurd centipede-like appearance. There is no justification for having a slow bit rate (1 MHz, 10 MHz) in parallel input and output pins. The centipede (or at least 40-pede) package entails all sorts of problems and overheads in packaging, mounting, testing, etc, etc.

4. Cheapness is not a complete justification for using a product, however absurd the product may be. The microprocessor is absurd. Would you buy an electric kettle from the cheapest source, if the very cheap kettle were the size of a thimble? Our over-riding requirement is for a piece-part which is practical; not one which is tiny or cheap.

5. Many years ago the main cost of a system came to be its testing, commissioning and maintenance; not its piece-part cost. The microprocessor could have been specifically designed for untestability (pattern sensitivity, inconvenience, etc). The extremely bad partitioning leads to an explosion in testing cost. They will never be free from (data dependent) pattern sensitivity. Except for trivial applications [illegible] pensive testing has been undertaken, say 50 times the cost of the microprocessor chip itself, microprocessor systems will be unreliable and expensive.

6. Registers (bistables) and combinatorial logic would not have been included on the same chip by a designer with significant experience in testing systems. Inclusion of any memory on the same chip as the arithmetic unit results in an explosion of cost in testing.

7. Why do we hear nothing about the physical location of arithmetic unit and registers on the microprocessor chip? Interaction between them is the key to pattern sensitivity. Are we really so stupid as to buy glamour with our eyes shut? Is a machine designed one third of a century ago glamorous merely because it is small? What price a horse and carriage the size of a pin head? Would you like to pay a mere $50 for a handbag full of pencils the size of a finger nail? How absurd can this industry get?

8. Microprocessor manufacturers have displayed ignorance of the mechanism of digital signal propagation and voltage decoupling. Placing voltage pins at opposite corners of the package is the worst possible choice and will limit the speed of micros. Of itself, this will make microprocessors pattern sensitive — the failures depending critically on how printed circuit boards are laid out.

By hoping to slide by with a minimum of knowledge, skill and thought, the computer industry has frequently landed in silly mess. In the past, the silliest microprocessor [illegible]


# Harris Series 100 speaks your kind of language

Fortran IV · Cobol 74 · Basic · Harris Macro Assembler · RPG11
Forgo (Diagnostic) · Snobol 4

In fact, the Harris Series 100 range of five general-purpose, virtual memory computer systems can handle all these languages simultaneously. That makes them ideally suited for use in commercial, scientific and educational roles.

Each of these modular, complete systems is an expanded and more powerful version of the S110, the basic model in the series which features:

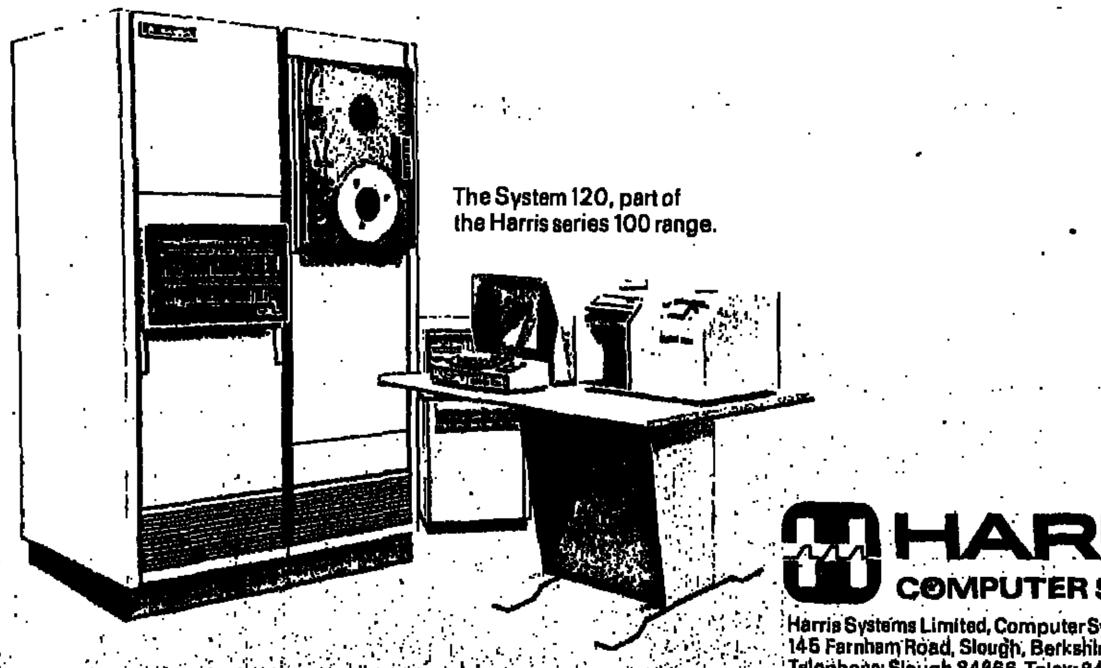
- ☐ 96K Bytes of Memory and a Scientific Arithmetic Unit
- ☐ System console CRT with keyboard and controller
- ☐ 10.8M Byte Cartridge Disc and 9 track, 800 BPI, 45 IPS Magnetic Tape Unit, with associated controllers
- ☐ DMA Communications Multiplexer
- ☐ Seven language processors, five support libraries – including Total, the renowned Data Base Management System and four RJE and two RBT packages.

A card reader and line printer are standard with all, except the basic system, the S110.

To ensure maximum efficiency in every system, the Harris Virtual Memory Manager (VULCAN) comes as part of the overall package.

VULCAN is a comprehensive demand-paging virtual memory operating system with a simple user-oriented job control language.

With VULCAN each system can operate, concurrently, in interactive time-sharing, multi-level batch processing and real-time processing modes. And with VULCAN, all seven processing languages and support libraries can be used simultaneously.



The System 120, part of the Harris series 100 range.

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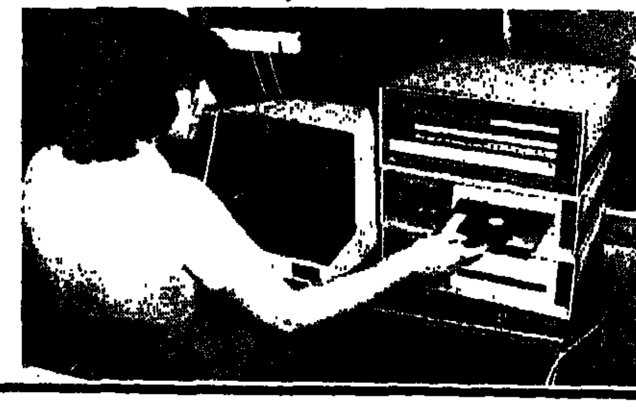
# "COME AND SEE COMPELEC FOR MICROCOMPUTERS"

Compelec have now been supplying Altair microcomputer systems for some 18 months. In excess of 60 systems have now been installed. Typical users include: Universities, Technical Colleges, and Government Businesses.

The machines are being used for:—Research, Tuition, Software development, Specialised Hardware development, Business application and Process Control.



ALTAIR™ The first word in microcomputers

8800b

The Altair 8800b is a multi-purpose computer designed to make your system planning care-free. Our Altair family of peripherals and plug-in options gives you the variety and flexibility required for today's wide range of microcomputer applications.

Once you decide on an Altair computer, count on MITS for the support necessary to make the best use of your system now and in the future. If you're looking for a microcomputer, stop. You've found Altair.

Altair 680b is a complete 6800-based computer that's compact and expandable. Here are five good reasons why the Altair 680b may be just the computer you're looking for:

1K bytes of RAM on the main board.

A 256-byte PROM monitor that allows immediate loading/running of programs (no boot loaders necessary) and examining and modifying of memory locations.

An on-board I/O port that may be configured for RS232 or TTY transmission.

Altair 680 BASIC is available and has all the many features that made Altair 8K BASIC famous.

An Altair 680 Assembly Language Developing System, including Assembler and Text Editor, is also available for the 680b.

680 BASIC & 680 Assembly Language Development System purchased separately, or a copy included free with an Altair 680b 16K memory board.)

A variety of optional memory, I/O and special-purpose pc boards have been designed especially for the Altair 8800b computer.

These options give the Altair computer its multi-purpose capabilities and make system planning an efficient, open-ended process.

The following plug-in boards are currently available:

**memory**

Synchronous 4K Memory Board (88-S4K)
Synchronous 16K Memory Board (88-16MCD)
Static 4K Memory Board (88-4MCS)
Static 16K Memory Board (88-15MCS)
PROM Memory Card (88-PMC)

I/O

Two-Port Serial I/O Board (88-2SIO)
Four-Port Parallel I/O Board (88-4PIO)
Audio Cassette Recorder Interface (88-ACR)

**special purpose**

Process Control Interface Board (88-PCI)
A/D-D/A Converter Board (88-AD/DA)
Vector Interrupt/Real Time Clock Board (88-VI/RTC)
A/D Converter and Multiplexer (88-ADC and 88-MUX)

**SOFTWARE**

8K BASIC
4K BASIC
Extended BASIC
Disk BASIC
Timesharing BASIC
Disk Operating System

**Package II**
An assembly language development system for the 8800 series microcomputers utilizing audio cassette and paper tape. Minimum memory requirement: 8K.

**Multi-Bootloader PROM and Disk-Bootloader PROM**
These two loader PROMS are time and sanity savers that eliminate the job of bootstrap toggling.

Want results you can see?
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Yet, it's priced low.
If you think the SMART TERMINAL is going to cost you an arm and a leg, for a few more features — THINK AGAIN!
For a suggested retail price of £695 only, the IQ 120 gives you upline, tab, home, and absolute cursor addressing in addition to the usual forespace, backspace, down-line, new line, and return.
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What's more, it offers field protection, auto repeat, and a numeric pad. Plus 15 switch-selectable baud rates, 80 x 24 standard format, and a standard RS-232 interface.
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● From page 24

The two main exhibits will be the Multipoint Network Control System (MNCS) which can identify the portion of a network which is malfunctioning, and the Circuit Quality Monitoring System, CQMS. This can monitor, test and diagnose the performance of high speed networks.

A portable diagnostic unit, the Digitech Pacer, will be on show on the **Aspen Electronics** stand at Wembley.

A low cost portable circuit tester, the TCT 10, will be one of the data communications products on the **Plessey** stand. Another will be the TDTS 10 telegraph and data test set which can be used for testing modems as well as teleprinters and data circuits.

The main product on the **Systems Reliability** stand will be a customised network communications processor, Netcom. This can interface many terminals and computers and can handle the communications protocols of different devices connected to sections of the network.

Making their UK exhibition debut at Compec 77 will be a range of modems built in the UK by **Borer Electronics Ltd**, the UK subsidiary of Borer Electronics AG of Switzerland.

# TI hits back with bubble memory

The range comprises low cost 300, 1,200 and 2,400 bps units and will be shown alongside the existing Borer 48LSI 4800 bps modem.

A line driver/converter, the LSL/20, which can convert CCITT V24 to 20 milliamp current loop or vice versa will be one of the main exhibits on the **K & N Electronics** stand, along with an acoustic coupler, the AC 350. This can operate at any speed up to 30 chps.

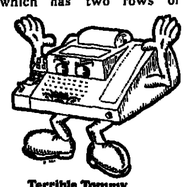
The impressive line up of printer and printer terminal products at Wembley will include one with bubble memory data storage. This is the 765 Memory Data Terminal which can be seen on the **Texas Instruments** stand.

The 765 is based on the classic TI Silent 700 as is the 770 which comes with a 1,920 character VDU and incorporates the 16-bit TI TMS 9900 microprocessor.

**Diablo Systems** will be launching a 200 chps bi-directional matrix printer, the Model 1660, which can operate as an IBM 2741 compatible, APL or ASCII terminal. This will sit alongside several versions of the HyType II daisy wheel printer.

Modifications of HyType units for IBM and ICL mainframe users will be demonstrated by **Zygal Dynamics** at the show, while products built by Diablo's main competitor, **Qume**, will be exhibited on the **Facit-Addo** stand along with Facit's own 4540 250 chps bi-directional matrix printer.

A "double daisy wheel" printer, the UDS-Ricoh RP-40 which has two rows of



**Terrible Tommy Teletype**

characters on the stems, will be demonstrated by **Ultrasonic Data Systems.**

Printer terminal manufacturer **Anderson Jacobson** will be introducing a 60 chps dot matrix terminal, the AJ860, at the show. Other AJ products will include the AJ832 impact printer plotter which can be IBM 2741 or APL compatible.

A terminal that incorporates a 30 chps printer, a keyboard and a VDU in one unit, the ZIP KDP, will be unveiled by **Data Dynamics**, while **Teleprinter Equipment** will present a wide range of printer terminals, including the Model 43 from the **Teletype Corp** which runs at 30 chps and uses a nine wire matrix head.

An alphanumeric 50 chps unit printing up to 40 columns and costing about £400, the Anadex DP-1000, will be featured on the **Bell and Howell** stand, while **Olivetti** will be showing two new terminal systems. These are the 30 chps TC 480 ASR unit, which can transmit at up to 1200 band, and a video terminal, the DE 700.

Versions of the Digital Equipment DECwriter printer/terminal will be shown on several stands, including those of **Extel**, which will have an ASR version, and **Peripheral Hardware.** This firm will also be showing the SCI 1100 VDU printer which runs at 2,200 chps.

A microprocessor controlled 1,200 baud teleprinter, the T 1812, will be highlighted on the **Tally** stand along with the 500 lpm T 5000. This uses what is claimed to be a unique dot matrix printing mechanism involving a rotating helix and knife edge hammers.

**Potter Instruments**, which originally developed this technology, will show its own version of the Helix printer, the LP 6351.

Making its UK debut at Compec will be the "New Era" range of printers from **Dataproducts.** This includes the low cost 300 lpm B-300 band printer; a 200 chps matrix printer, the M-200; and the T-80 thermal printer.

Two of the biggest matrix printer manufacturers, **Logabax** and **Centronics**, will be at the show. Logabax will unveil the prototypes of the LX 36 range, its next generation of matrix printers; while Centronics will show off its 700 series alongside the Micro-1. This costs less than $600 (£338) and prints at 240 chps on aluminium coated paper.

A range of electrosensitive serial matrix printers and plotters will be introduced at the show by **Datac**, while **EMI Technology** will launch its SE1000 Series electrostatic printer/plotter.

Printer/plotters from **Houston Instruments** will be shown by **Pragma**, as well as the whole range of Beehive VDUs and Sykes OEM disc systems.

A paper tape terminal

● Turn to page 27

## Training staff a la VDU

**A new video based package for busy DP managers wanting to train their clerical and administrative staff will be the main feature on the National Computing Centre stand at Compec 77. Called "Basic Computing Concepts," it is a half-day course aimed at providing a general understanding of computer systems and comes in the form of four video tapes.**

**The NCC will also be promoting three new video tape programming courses covering Cobol, Algol and Fortran, and will also demonstrate two new audio tape courses. These are "Implications of Computer Systems," which is designed to give an appreciation of computer systems to managers; and "Filetab Learning Module." This is a self-instruction course for users of the NCC software package, Filetab.**

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Megastore. Ready now as a software-transparent replacement for Novadisk (Megastore 1223) and DEC's RJS03/RJS04 Disk (Megastore 11). Also available as Megastore 4666 for users who wish to provide their own controller. For further information contact Ampex Great Britain Ltd., Acre Road, Reading, RG2 0QR. Tel: (0734) 85200 Telex: 848345.

AMPEX

Novadisk is a trademark of Data General Corp.

**A built-in Honeywell Level 6 computer provides the intelligence for the Smart Desk — one of the main exhibits on the Honeywell stand.**

# Silicon Valley

● From page 19

someone for your er-raw materials, we could handle your accounts payable. No, Sir, I don't think we have an existing blackpudding installation but this is a general purpose device".

The following year even more thousands crowded to see a multi-terminal application "manned" by a bevy of low-cut, skin-tight, silver-suited grisettes. At this Motor Show level of selling, no-one recalls the application. I know someone who actually married one of the demonstrators but neither partner can remember even the name of the manufacturer.

These exhibition excesses occurred in dear ould England. What of the USA where selling, as we know it today, was invented? In spite of the obvious "consumerism" which offends the English psyche (and being half Irish, I am only partly offended) there is a redeeming pragmatism underlying the Madison Avenue machine, in so far as unsuccessful methods are quickly dropped.

The effectiveness of the advertising paraphernalia, for example, is readily quantifiable and the consumer, voting with his/her dollar, exerts a more democratic influence on the publicity Apparat than he/she does by infrequent votes in the political arena.

Cynics have observed that even the films, books and soap which knock the advertising system are promoted via the most respectable agencies and some suspect that Urban Terrorism Inc (a growth industry vying with electronics and yoghurt ice-cream for a place in the Dean Witter charts) retains only the finest PRs. Certainly the low-cost, full-media coverage achieved by the underground guerrillas is the envy of the computer lobby.

The exhibition scene (or, perhaps, one should say, the expositional environment) where supplier and prospect are encouraged ever more explosive and outrageous ploys to grab the eyes, ears and lapels of the unwary.

We have seen the Bits 'n' Pieces and the Bytes 'n' Flights approach, but are there still account managers with the same do-or-die Minuteman faith in the products under their trust, that they will hijack their Grosch or booby-trap IBM to blow up Putney Bridge to hit the DP headlines?





# Compatibles dominate mag media

● From page 26

designed to be used with matrix printers will be the main exhibit on the stand taken by the US firm, **Drillick Lamanna Corp.** Called the DLC Model 3000 it provides ASR capability, operates at 300 baud and is housed in small floor standing pedestal.

**Trend Communications** is introducing the Trend Dual Cassette 400 magnetic tape cassette unit. This is software compatible with the Digital Equipment TA11 cassette tape system and will be shown alongside the Trend 800 range of 30 chps matrix printer terminals.

A new range of digital cassette recording systems is being put on show for the first time in the UK at Compec by **Philips** while **Sintrom Electronics** will feature its full range of **Perex** cartridge units as well as two new products manufactured by Perex — the Peritext IB4 text editing terinal and a graphics system.

**Pertec** and CPU Computers, the UK distributor for **Shugart Associates**, will both show double-sided, double density minifloppy disc drives, while **Data Dynamics** will be exhibiting a full sized floppy disc drive mechanism called the Mayflower.

IBM compatible floppy disc subsystems from the AED 3100 series manufactured in the US by **Advanced Electronic Design** of Sunnyvale, California will be shown by **Dicoll Electronics**, and **Control Data** will include floppy disc units in the line up of disc drive products on its stand.

A 3000 Megabyte disc drive for the Hewlett-Packard 3000 series II computers will be featured on the **Telefile** stand, and **Plessey Memories** will have an offering for Digital Equipment users.

This is the PM-DS/11, a plug-in alternative to the DEC RK11 disc system. **Digi-Data** will be showing a range of magnetic tape controllers for DEC PDP-11, Nova and HP 2100 computers.

Firms exhibiting magnetic

**A major attraction on the Logabax stand will be the highly successful LX 180 matrix printer — or is it the model?**

media of various sorts at Compec will include **Nashua** which will have a 200 Megabyte pack among its line up of products.

**Willis Computer Supplies** will introduce a 5¼ inches square minidisc for minifloppy drives, while **BFI Electronics** will be showing double density floppy discs from the **Information Terminals Corp** Series 8000 as well as its own offering in the mini disc area, the MD-525.

The centre of attention on the **Pyral** stand will be the new Delta 10,000 magnetic tape reel for 6250 bpi density drives. It will be joined by the rest of Pyral's wide range of computer media.

Sharing Pyral's stand will be **PCA** with a complete range of computer room accessories and furniture, including the Vidirol and Vidstat mobile stand and static workstation for VDU and microfilm/fiche viewer operations.

An interesting variety of wares aimed mainly at users of Digital Equipment PDP-11 computers will be exhibited at Compec by **Fungus Computer Products.** The kit will include a VDU, a matrix printer, DEC compatible interfaces and magnetic tape systems and MOS memories.

**Fabri-Tek** will also have PDP-11 compatible semiconductor memories on its stand, including the Add In 11 which comes in 16K x 18 bit and 16K x 16 bit configurations.

Core memory will be among the products on the **Ampex** stand, including Megastore, a replacement for fixed head disc memory.

Three products being shown at Wembley by **Penny and Giles** are the VDP 400 intelligent video terminal, the Hydra bi-directional printer and Midos 500 microprocessor controlled floppy disc system.

Products on the **Adler Business Systems** stand will include a new desk top paper tape reader/punch, the Roytron Model 1560-AS, while **Licon Electronics** will be featuring custom designed solid state keyboards and switches.

**Documentation** will be showing card punch and reader equipment, while optical mark readying, OMR, data input will be featured on the **Data Recognition** stand where a hand held data capture terminal, the Dataport 5, is being launched.

Factory data collection kit will be the main attraction on the **Feedback Data** stand, where the microprocessor based 480 terminal will be making its debut, and handprint direct data entry using Datapad can be seen on the **Quest Automation** stand.

Last but not least, **Smith and McLaurin Ltd** will be showing Pancake + at the Wembley Jamboree. This is gummed label paper which can be used in virtually any computer stationery set and which lies flat under all humidities, according to the manufacturer.

# User's needs set guidelines

● From page 20

maintenance, and even to software plug-in microcoded PROMs are already displacing traditional coded software for many system functions.

Many mini manufacturers are already heavy users of the smaller micros. It seems a logical progression to devolve more and more system functions on to an internal structure of discrete micros.

On the other hand, it seems unlikely that costs to the end user of a minicomputer system can decrease much more. The big impact will come from the dramatic improvement in performance that can be purchased at a similar price.

Cost reductions can only come from reduced manufacturing costs, for example by simplifying PCB construction and miniaturising components, or by increased production, perhaps as a result of improving the general-purpose capabilities of the computer or the micros it uses.

On the other hand, actual design time remains more or less the same. So do support costs, to a great extent: and the time needed to physically insert components and test completed PCBs is also relatively static. Most important is the high people cost of software.

One recent survey showed that fully one half of all micro applications needed at least 1,000 man-hours of software while one-third took more than 5,000 hours.

The conclusion is inescapable: software is expensive, and micros need software just like "real" computers.

To some extent the microprocessor is presently at the same stage as the mini some eight or ten years ago: it looks like an exciting system component, but it needs some more support — particularly in programming — before it can realise its full potential.

Redesign is an integral part of the micro business, and so is upwards development. It makes sense for the mini makers to slot in a compatible micro at the bottom end of their more conventional mini lines.

The future will inevitably see more blurring of distinctions, between micros and minis; between intelligent terminals and stand-alone systems; between multiprocessor mainframes and interlinked networks. And it is the needs of the user that are establishing the guidelines.


NEW FROM GEVEKE

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30 cps terminal, V24and 20 mA interface

★ **Diablo 1660**
Micro processor driven, 200 cps terminal

★ **TEC Model 70**
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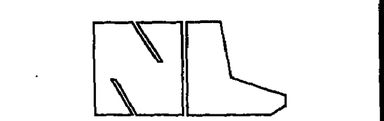

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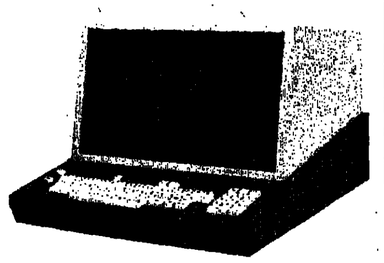

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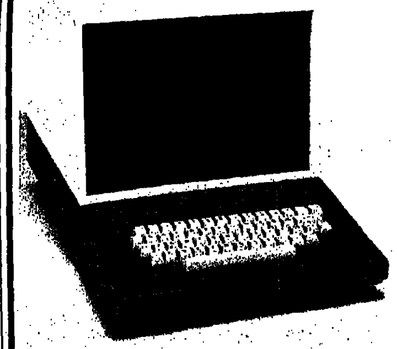

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# Micro Focus develops CIS Cobol compiler

THE growing market for 16K byte systems, in the form of micro-based intelligent terminals and small business systems, has attracted the development of a new Cobol compiler from Micro Focus.

Called CIS (Compact Interactive Standard) Cobol, the new language features facilities that have been taken from the ANSI 74 standard to provide a wide range of file handling and data manipulation features. Subsetting has been achieved in such a way that one option has been chosen for each facility where the full Cobol language would provide a number of options.

The prime market seen by Micro Focus is the micro and terminal manufacturers, as the language is device and machine independent. Worldwide marketing is to be undertaken by Dataskil, with whom Micro Focus has a loose association following development work on the implementation of the language for the ICL 1500 Transaction System. It is therefore seen initially as an OEM product for this market area.

According to Micro Focus, the major strengths of the language include its suitability for financial transactions, and its effective facilities for data entry and distributed processing.

Its data description facilities include full length, 30 character data names, 49 levels of records and three types of common data. Alphanumeric data in character strings up to 8,192 bytes, numeric data up to 15 decimal numbers and up to 12 picture symbols for numeric edited data can be accommodated as part of data description.

Interactive facilities within the standard Cobol syntax have been provided by using the Accept and Display statements to allow the user to input and retrieve data at a VDU terminal. These two Cobol verbs have been found easy to use because the screen layout is described during data description in the same way that a record is described. Data is shown on the display in the described format and data is accepted from the keyboard into the fields described in the same way. It is, therefore, particularly effective in transaction processing.

CIS Cobol allows the description of files on a variety of peripherals.

## Actrion III system

THE Actrion Division of McDonnell Douglas has introduced a numerical control system for machine tool applications that employs three 16-bit microprocessors, and is available in either stand-alone or "naked" OEM form.

Marketed in Europe by AEG Telefunken, the Actrion III system can operate with a wide range of three and four axes machine tools.

The three micros, commercial versions of the UDAM military 16-bit device, operate into a common memory of between 4 and 16K, depending on application.

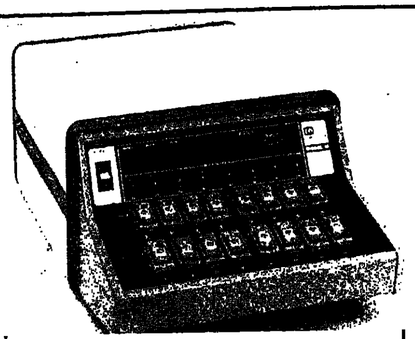
## Sinister side of the micro revolution

**THE revolution in the computer world that is being caused by the microprocessor has both a good and a bad side, members of the Leeds and District branch of the British Computer Society were told recently, during a presentation by Andy Reichert of Logica.**

**For the first time, Reichert told them, processing power is available to the masses, rather than being the property of the few. He outlined just a few of the many potential applications to which the micro can be put, such as an automated version of the domestic iron, and automated farming equipment that would provide better control over the supply of foodstuffs.**

**But many of these advances would carry with them a counterbalancing disadvantage, and as Reichert said, it is a sinister side of the revolution.**

**The large proportion of the applications now being foreseen for the micro are labour saving. Indeed, many are being considered specifically for that reason. He pointed out that society is, therefore, becoming one in which unemployment will be the norm and work will be a privilege.**



**UP to 16 erasable PROMS can be programmed at one go with the new Data I/O Model 16 programmer, available in the UK through Microsystem Services, of High Wycombe, Bucks.**

**Data is loaded into the machine via a standard RS232 interface into an internal 2K byte memory. Before programming commences, the Model 16 will check to ensure that all devices are correctly inserted, and then test all address and datalines for open or short circuits.**

**Correct operation of the PROM chip-select lines is then verified; the programmer's internal power supplies are cycled and checked for correct output, and each PROM is tested to ensure it is a blank. Provided no faults are found, the integrity of the program data is verified and the devices programmed.**

**When programming is complete the contents of the PROMs are compared with the internal memory to ensure correct programming.**

## Foley stores personal computers

MASS marketing for personal computers in the US has, in a small way, now become a reality. Altair computer systems are to be sold through the calculator department of Foley's Department Store, in Houston, Texas, and is claiming the title of first mass merchandiser to stock computers in the US.

The Altair 8800b turnkey systems, retailing around the $5,000 mark, will be supported by a variety of software packages from Pertec, including a mailing list maintenance file, a small business check maintenance file, a finance program, and a range of educational games routines.

## Nascom 1 micro kit is yours for £197

IF, perchance, you can spare £197 and find a reasonable excuse for being near the Wembley Conference Centre on November 26, it will be possible for you to attend a seminar introducing the Nascom 1 microcomputer kit, and then buy the hardware.

The kit is produced by Lynx Electronics (London), an offshoot of component distributor, North American Semiconductor. It includes a Mostek Z-80 processor, a 2K by 8 bit RAM, 1K by 8 bit EPROM monitor program and on-board expansion facilities for memory expansion to 2K, an additional 16 lines of I/O plus the facility to address a total memory of 64K bytes.

The most significant inclusion in the kit is a full QWERTY keyboard unit and 16 line by 48 character display interface for direct connection to a standard TV set.

Further details of the seminar (and the kit itself) can be obtained from North American Semiconductors. 92 Broad Street, Chesham, Bucks. Tel. 0245 75151.

## More 4K static RAMS

FURTHER additions have been made by Intel to its range of static RAMs, with the introduction of a 1K by 4 bit device called the 2142, a low-power version of it called 2142-L, and a low power version of the recently introduced 2114, designated 2114-L.

Basically similar to the 2144, the 2142 device differs primarily in being packaged in a 20-pin housing, which has been designed specifically for microcomputer and similar bus-organised systems. Two extra pins are used to provide a second chip-select input and an output disable control compared to the 18-pin packaged 2114.

Both the 2114 and 2142 are available with a choice of maximum access times and minimum read and write cycle times — 200, 300 or 450 nanoseconds.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| 370/145 | 512K Floating Point 2 selector channels, console | £5500 4 yrs. | £4800 5 yrs. |
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| 370/158 | 2 Megabyte, Console & printer 4 Block Multiplexors. | £17980 | £15970 |

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## NEWS IN BRIEF

### First user of Siemens' laser printer

FOLLOWING its order for two IBM 3033 large-scale processors (CW, August 18), the big German Datev bureau for tax accountants is to become the first user of Siemens 3352 21,000 lpm laser printer. The bureau is paying over four million marks (£1.1 million) in total for four printers, which are due for installation early next year. The bureau also has two of IBM's 3800 laser printers on order (CW, May 12).

The 3352 is also offered in an OEM version called the ND2 and is to be marketed worldwide by Itel.

ORDERS worth more than £150,000 have been taken by ICL for its 931 cash receipting terminal for local government in the first three months. The 931 is controlled by a 1500 minicomputer which can handle 12 terminals. Each terminal records a transaction on a rent card and tally roll as well as producing a receipt.

THE Lunan group, already established in the field of executive staff recruitment, has formed a data processing staff agency and consultancy. Named Jean Dennington, it is at 14 New Burlington Street, London W1X 1FF.

THE UK leasing company Atlantic Computer Leasing continued its growth of 20% a quarter in the first half of this year. The biggest income came from leasing which accounted for almost £4.2 million. Equipment sales totalled over £900,000. Profit after tax was £601,800.

A 500,000 square-foot factory and laboratory complex is to be built in Tucson, Arizona, by IBM to house the manufacture of magnetic tape drives and the 3850 mass storage system. Manufacturing will be moved to the new plant from an IBM facility in San Jose, California, while the laboratory work will move from Boulder, Colorado.

A STANDBY power unit for use with its IN-4011 core replacement semiconductor memory for the Digital Equipment PDP-11, has been introduced by Intel. It comprises a 20 amp-hour sealed gelled electrolyte battery, which supplies the input for an inverter. This is rated at 300 volt-amps and is protected against damage through overload and short circuit.

**A MOVE from its present Bar Hill site to the Cambridge Science Park is planned by contract research and development company, Cambridge Consultants. The new offices, laboratories and workshops, valued at £500,000, will occupy four acres and will provide the 50% increase in workspace needed by the company. Construction work should be completed by December 1978, and the 20 acre Science Park, sponsored by Trinity College, Cambridge, is the only one of its type in the UK. In our picture, Richard Cutting and Ron Armstrong, of Cambridge Consultants, view the new site.**

## TI director's £1m gift to Oxford University

A GIFT of £1 million has been made to Oxford University by a founder-director of Texas Instruments, Dr Cecil Green, and his wife, for a new graduate college which is being established.

The medical college, which will be housed in the Radcliffe Observatory and its associated buildings, was to have been called Radcliffe College, but the name Green College has now been proposed.

The gift will enable the necessary building programme to be carried out, and it is expected that the college will be open in three years' time.

Manchester-born Dr Green went to school and university in Vancouver before attending Massachusetts Institute of Technology whence he graduated as an electrical engineer.

In 1930 he helped to found Geophysical Service Inc of Texas, later Texas Instruments, and became its honorary chairman in 1959.

## DG adopts Winchester technology

ONE and two Megabyte Winchester technology disc drives have been introduced by Data General for attachment to Nova and Eclipse minis running under RDOS and AOS. Use of Winchester technology, introduced by IBM with the 3330 subsystem, enables the discs to have a fast access time of 10.12 milliseconds; transfer rate is 0.91 Megabytes per second.

Up to four drives can be supported by each subsystem in any mix of the two sizes.

## World's biggest online information retrieval service

**USING two IBM 360/65 systems at Lockheed's research laboratory in Palo Alto, California, the Dialog system provides the world's largest online information retrieval service (CW, October 20). Data on topics such as the social services, technology, business, economics and biology is available through the Lockheed Corporation.**

**The service is used by over 3,000 librarians and researchers all over the world in schools, universities, industry and central and local government. Dialog is marketed in the UK by Learned Information (Europa) Ltd, 1 Falconberg Court, London W1V 5FG.**

**The system is accessed via a conventional computer terminal. Most types of terminal and VDU are compatible with the system.**

**A typical search for information will take about 10 minutes and cost from £3 to £11. Users are charged from signing-on to signing-off time, so it is in their own interest to use the service efficiently.**

**There are 80 databases online, of which NTIS is one of the largest. Provided by the US government, it consists of over 500,000 references on matters involving government-sponsored research, development and engineering, and provides an outlet for unclassified information from such agencies as NASA.**

**Agricola is a cataloguing and indexing database which provides worldwide coverage of agriculture and related subjects. From the Institution of Electrical Engineers in London comes Inspec (CW, November 22, 1973), which has over 900,000 references on such subjects as physics, computing and electronic engineering.**

**Additional databases are being applied to the service at the rate of one a month. Two produced in Britain are already used as part of the system. One comes from the Commonwealth Agricultural Bureau at Farnham Royal, near Slough, and contains 500,000 references from worldwide publications.**

# Do-it-yourself wire tapping manual

**From Becky Barna in Washington**

THE US government has published a do-it-yourself manual on wire tapping and other penetrations of telecommunications systems, causing some Congressmen to ask whether too much openness is not as damning as too much secrecy.

After obtaining a federally funded study that neatly packages blueprints for potential perpetrators, Democrat Congressman John Moss wrote a pointed letter to the General Accounting Office, asking the governmental audit agency to investigate the reasons why a report, prepared by the Mitre Corporation under a $47,000 government contract, "appears to be a how-to-do-it manual on non-court-ordered wire tapping."

Although the GAO did not prepare that report, the agency has compiled and released to the public its own study on the vulnerabilities of telecommunications systems.

The GAO report, released to the public earlier this year, was prepared at the request of Congressman Paul McCloskey, also of California.

It concludes that most commercial and government telecommunications systems "do not provide the degree of security necessary to protect information." But in the process of supporting that conclusion, the GAO investigators describe the techniques and devices used to gain access to telecommunications systems, to insert communications into networks, and to intercept and interpret communications network traffic.

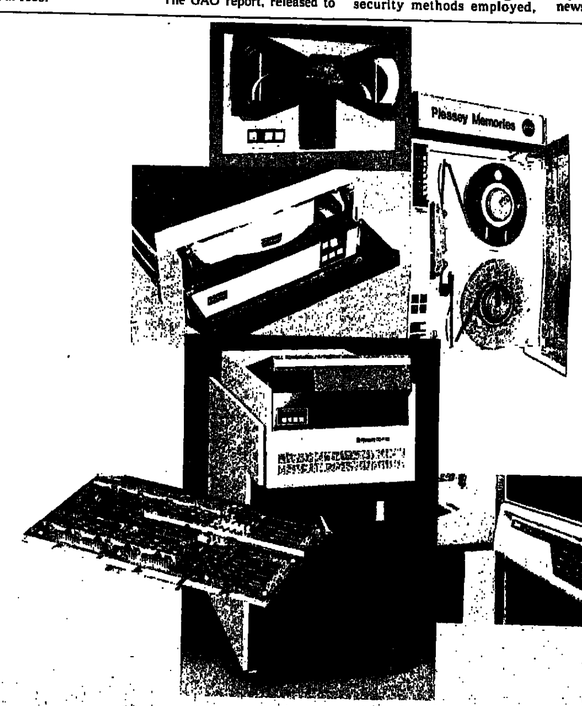
According to the GAO report, "a perpetrator may enter government telecommunications facilities not having adequate physical security and use the terminating equipment without being observed."

In addition, the report supports its statement by pointing to specific government systems with lax security, detailing the security methods employed, their degree of effectiveness, and methods interlopers may use to escape detection.

The manual describes the equipment most likely to penetrate successfully voice, record and data networks, the cost of the equipment and its effectiveness. To further aid a phone phreak, the report provides a glossary giving precise definitions of every technological term mentioned.

GAO encourages the would-be phone tapper by stating that even if a penetration is detected, the perpetrator probably will not be identified "due to the time lapse between the penetration and its investigation." For instance, the report supplied data indicating that the 930 investigations of telephone crimes carried out by the FBI in 1976 yielded only 20 convictions.

The phone phreaks may not make a habit of reading GAO reports, but they do read the newspapers.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## DP/user communication—Part 3 of series by Nigel Laurie

# User realities: A failure in telepathy

THE first law of modern psychology states that what is quite obvious to you, no one else can see at all. Which is, perhaps, why the late Robert Kennedy used to say that if you wanted to judge a system you should look at it first through the eyes of those it affects. You should always think yourself into the realities of those whose work and lives depend upon it. Otherwise your criticisms and suggestions can go wide of the mark.

Now DP staff know their own job pressures only too well. They need to make a big capital investment pay off. They have to meet technical standards within financial constraints. They have to meet the rising demands of users who may seem to be "ignorant", "intolerant", "dim" and generally "pretty slow on the uptake".

Many of the pressures on DP staff can be controlled directly by DP management. But this problem of pressure from users calls for insight as well as action if it is to be handled with success.

Typically a failure to accept these facts about any end users makes user relations less productive than they might be.

**End users are self centred — and have to be.** For the end users, DP is a working aid, not an investment whose return they must protect. Whatever the impact on costs, end users will naturally want the earth. They are self-centred because they are job-centred. Its deadlines and its pressures give rise to the demands they make. The DP service is judged "effective" when it helps them perform well. That what they want might be ruinously uneconomic to provide will not occur spontaneously to them. And why should it?

**End users are 80-20 people.** Programming is a 100% art. A program works when it works and not before. Coders aspire to the precision of mathematics — though they rarely attain it.

Many users on the other hand struggle not with errors — but with uncertainty. Their prime skill is analysis and decision-making under conditions of uncertainty. They know that 20% of their effort produces 80% of their results. They know that every decision entails risk. For them there is no wholly right solution, only the best possible in the circumstances (not all of which can be known). They know, in short, that business is not an algorithm.

Compared with a programmer's outlook, the difference is slight. But it signifies a gap of temperament and a focus in work of immense importance. For the programmer, technical finesse becomes a source of pride and can become an end in itself — and understandably so. For the busy end user the whole notion can come when the chips are down, which may seem an almost unforgivable indulgence.

**End users are independent.** "It can't be done that way" — a reply so many users hear when they ask for special output. Still the DP mystique seems to work and users humbly take no for an answer. But negative answers turn off users as well as their questions. Sellers of micros and minis become more active daily. Unhappy users are good prospects. As prices fall, users find their budgets command high DP purchasing power.

## PROGRAMMER NOTES

# High and low in the language battle

A FRESH skirmish has begun in the perennial battle between advocates of efficient but machine-oriented low-level languages, and supporters of high-level languages which attempt to ease programming at the possible cost of efficiency.

The dispute began with a Computer Weekly book review. Dick Hales saw fit to criticise Allen B. Tucker's book, Programming Languages, for ignoring assembly languages. Hales spoke of "droves of programmers, brought up on books like Tucker's, beavering away without realising that 'high-level' is merely a skilfully marketed euphemism for 'inefficient'."

The review brought an immediate response from Martyn Thomas, of the South West Universities Regional Computing Centre, Bath, suggesting that such an attack on high-level languages had no place in a book review and criticising the reviewer.

Hales has in turn written to Programmer Notes, amplifying his reasons for favouring assembly languages, and his argument that language similarities are greater than supposed and worthy of more attention than their differences.

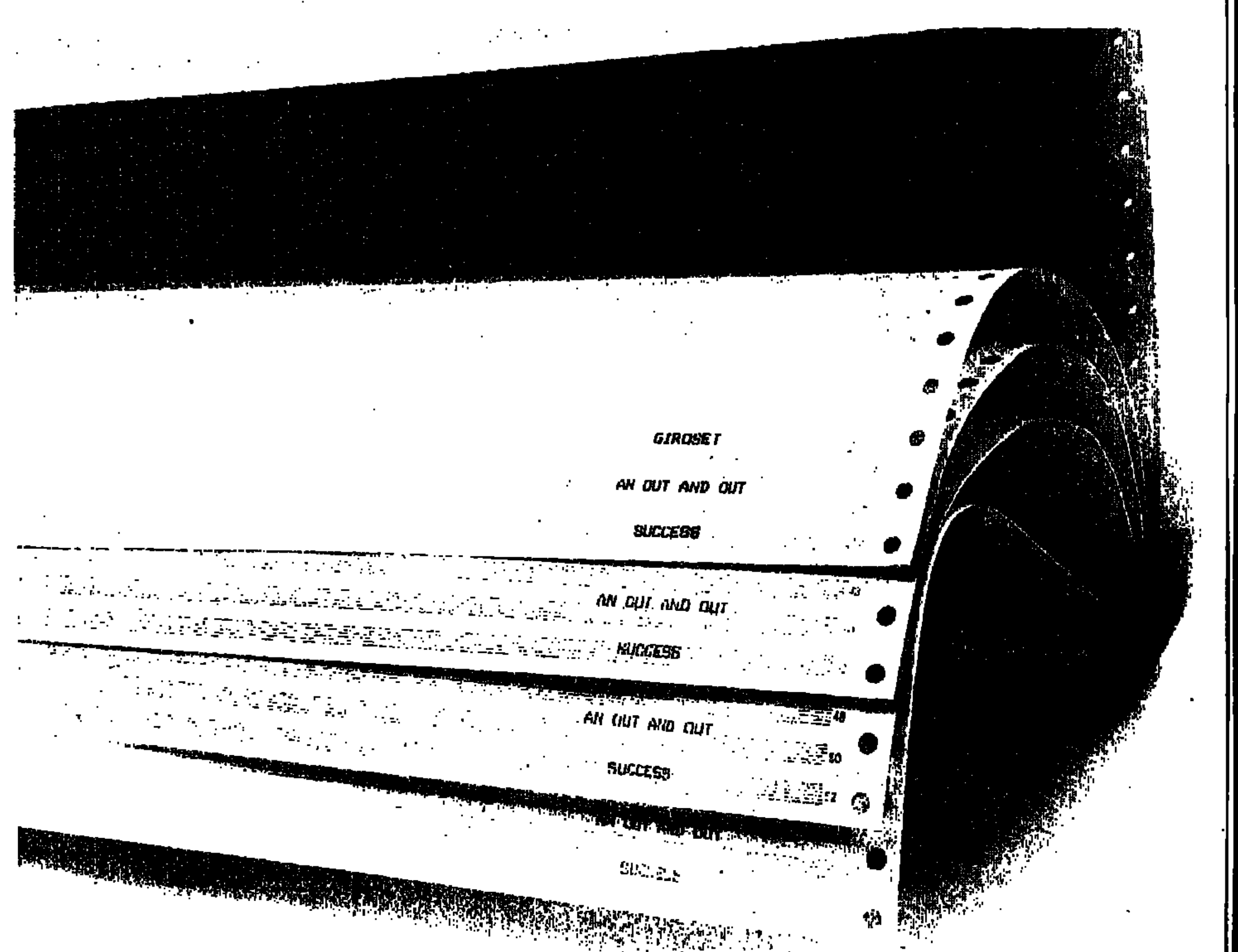
High-level languages, he says, were originally designed to enable "laymen" to write programs, rather than leaving the task to professional programmers. "Either from lack of interest or lack of encouragement, this did not happen," and there is still a professional programmer class.

Since the purpose has not been achieved, then for the programmers' use it would be better to revert to simplicity, Hales argues. Unfortunately, we are very much immersed in over-complex views of such simple entities as data.

"Data . . . consists of characters grouped into fields, grouped into records," says Hales, and languages should be concerned with manipulating these entities. Instead, each high-level language has "built up its own arbitrary concept of data structure, and its own insular methods for handling . . . processes."

Data preparation staff still have a feeling for the universality of data organisation, says Hales, and hence this function should supply the lesson for a straightforward programming language. Data entry languages designed for key-to-disc equipment show far more uniformity than programming languages.

Since the two protagonists have cast doubt on one another's qualifications, it would be appropriate to throw the argument open to practical programmers. Is there a place for a new universal low-level language? Is assembly programming a good foundation for competent and uncomplicated high-level programming?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## LETTER

# A DPM's proper priorities outlined

THE view expressed in User View (CW, October 20) that the UK data processing manager is unprofessional and not cost conscious, especially when it comes to plug compatible equipment, is surely too sweeping and too general.

To answer it with an equally sweeping assertion, it seems to me that any difference in attitudes is likely to stem from the difference that the typical US data processing manager has a fixed budget and, provided he stays within it, there is little detailed monitoring of his contribution to the business. The typical UK manager, however, has his detailed expenditure under much more continuous scrutiny and has to provide much more detailed justification. In these circumstances it is not surprising that in the US there is an incentive for the data processing manager to increase the raw throughput for the available money, whereas in the UK, particularly in the current economic freeze, we have to be much more aware of what contribution any expenditure can make to the business, and not simply to the power of the installation.

To be more specific, I am not likely to consider plug compatible equipment manufacturers because I am much more concerned with the overall cost effectiveness of the installation, an equation in which basic hardware, no matter how cheap comparatively, is but one ingredient.

There being a limited number of objectives which any data processing manager and his staff can thoroughly progress, it is essential to have our objectives in a proper priority order.

My own priorities are to address these questions:

1. Are we developing, installing and running the systems which help the company's business objectives most?

2. Do we have adequately trained development staff and the appropriate tools, methods and organisation to bring in such systems quickly and effectively?

3. Are our routine operations efficient and up-to-date, meeting measured objectives and performance levels, within the constraints of the software and hardware we have?

4. What software changes and acquisitions would help us better to achieve those objectives and how can we quantify the advantage?

5. What hardware changes or acquisitions would help us most, and how can we quantify the advantage?

This being so, hardware changes are subservient to other, more demanding, objectives, and failure to have those adequately resolved cannot be compensated for by clever purchases of plug compatible equipment.

My frank view is that, for the typical user, the time spent in proper evaluation of such alternatives is likely to be better spent on ensuring that the right level of equipment, both hardware and software, from the mainstream supplier is being used, and that its performance characteristics are thoroughly understood and, even better, in reviewing the applications actually being run and their contribution to the effective management of the business.

M. G. SHELMERDINE
Group Computer Manager
Ransome Hoffman Pollard
Chelmsford



## CHESSLAB by DONALD MICHIE

# End-game secrets

CHESSLAB recently reported (CW, October 6) the discovery that a chess-master who can guarantee to win from theoretically won positions against another master may be helpless to do it against an optimal defence implemented in a computer database. The example given was the play of king and queen against king and rook.

Interestingly, the earliest recorded use of an end-game database was in a human tournament, not in computer chess. Grandmaster Bronstein playing at Kiev found himself in an adjournment position with king, queen and pawn against king and queen.

It so happened that my Moscow colleagues Arlazarov and Futer had previously computed a complete lookup table of best moves for the entire space of more than a hundred million positions. They devised fast indexing and search routines for accessing it from the nine mag tapes on which the table was stored in their Institute's ICL System 4/70. Moscow was phoned, the relevant excerpt was output and the print-out put on the train to Kiev. After studying it during the adjournment Bronstein played on to win.

The Soviet Chess Federation is still debating the ethical point, although it is difficult to see how any important one can arise. For many years it has been the rule that during an adjournement a player may consult other chess-masters and also chess books. What is so special about a database?

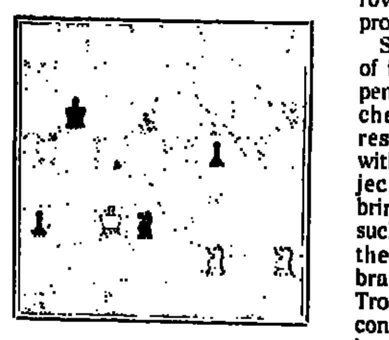
This same king-queen-pawn-king-queen database has, however, brought up a different problem for the rules of chess which is quite unrelated to ethical issues. The database shows that in the worst case, with a pawn on the 7th rank, no fewer than 58 moves are required for promotion against best defence. According to tournament rules the game must be stopped and a draw declared if 50 moves elapse without irreversible change in the board situation, i.e. a castling move, a capture or a pawn move. If in this special and limited KQPKQ game there are positions requiring 58 moves for progress, may not numerous other cases abound, unknown and unsuspected, requiring even higher numbers?

There is nothing academic about such questions from the standpoint of serious chess. The position shown here occurred in a match played in Vienna between Albin (White) and Alapin in 1900. A draw was agreed on the grounds that White, after capturing Black's knight and QRP, could not mate in 50 moves. Imagine Albin's mortification when it was later pointed out by Maroczy (a) that mate can be achieved in 49 moves and (b) that in any case the 50-move rule applies to tournament games and not to match games. The match rule specifies a 100-move limit.

No absolute guarantee, of course, exists that Maroczy's 49-move demonstration is correct. To construct an optimal-play database for the king - knight - knight - king - pawn end-game would be a task of approximately the same magnitude as the KQPKQ and KRPKR cases already done in Moscow. But Vladimir Arlazarov tells me that he does not propose to do any more of this.

Such a computation would be of interest, since KNNKP happens to be the only fragment of chess which has ever been researched and documented with the thoroughness and objectivity which the scientist brings to fragments of nature such as chemistry or genetics. In the introduction to his celebrated 60-page treatise A. A. Troitsky writes: "This end-game contains no more secrets." That boast was made in 1937. Although it has since been refuted in several particulars, the last word will certainly have to wait for machine analysis.

ALAPIN



ALBIN

FIGURE 1: Albin (white) against Alapin, Vienna 1900. A draw was agreed . . .

# Automatic tellers tried out by TSB

EMPHASISING its commitment to become a major new force in British banking, the Trustee Savings Bank is offering customers in the Greater Manchester area cash dispensing and automatic teller terminal facilities.

Two branches in Manchester itself, plus branches in Leigh, Warrington and Oldham, have installed Chubb MD6000 automatic tellers, and two more will install them early next year.

The terminals are online to the North West Central Region's ICL System 4/70 mainframe in Altrincham, and the facility is available to all customers with chequing accounts. They can withdraw up to £300 if their balance will meet it, and in addition they can get immediate notification of account balances and request statements, cheque books and information on loans, insurance and investment facilities. The terminals are at present all within the branches, but through-the-wall versions are to be installed at some branches next year.

According to a Chubb spokesman, the network is the only one in England debiting accounts in real time; out of hours, transactions will be batched up by the mini, a Computer Automation LSI-2 within the terminal.

TSB calls the service Speedbank; the Greater Manchester system is a pilot scheme for a possible national automatic teller service.

# Engineers buy Prime 300

A PRIME 300 has been bought by Ewbank and Partners, consulting engineers of Brighton, to carry out engineering, management information, project planning and word processing applications.

The system features 320K of main memory, the Primos III operating system, two 40 Mbyte disc storage modules and a 16 line multiplexer.

Ewbank will have seven terminals initially, and the company says that it chose the system mainly because of its engineering calculation capability of Runoff word processing software.

# Membership system costs £1 a head

A COMPUTERISED membership recording and subscription system has been introduced by Computer Management (West End), a member of the Computer Management Group.

Called Onex, the system features dial-up service costs of as little as £1 per member per year, and is aimed at professional bodies and organisations in the UK.

Clients gain access to the comprehensive membership record-keeping, subscription accounting, label addressing, examination processing and year-book production facilities via VDUs located on their own premises. These are linked to CMG's central computer installation in Croydon, which has a Burroughs B4700.

Onex is already in use with the Institute of Cost and Management Accountants, the Royal Institution of Chartered Surveyors, and the Royal National Life-Boat Institution, servicing over 155,000 members.

# Show brings more work

THE West Midlands firm of PFC (Business Forms), which specialises in forms for computer printers, has reported an early benefit from exhibiting at the International Business Show, as extra orders mean that it is having to take on six extra print workers.

Mr Ken Trow, managing director of the Cradley Heath firm, said: "A stream of British and overseas buyers and computer room managers visited our stand.

"The business which they have placed with us means that we now need six more operators for our continuous reel and sheet-fed presses."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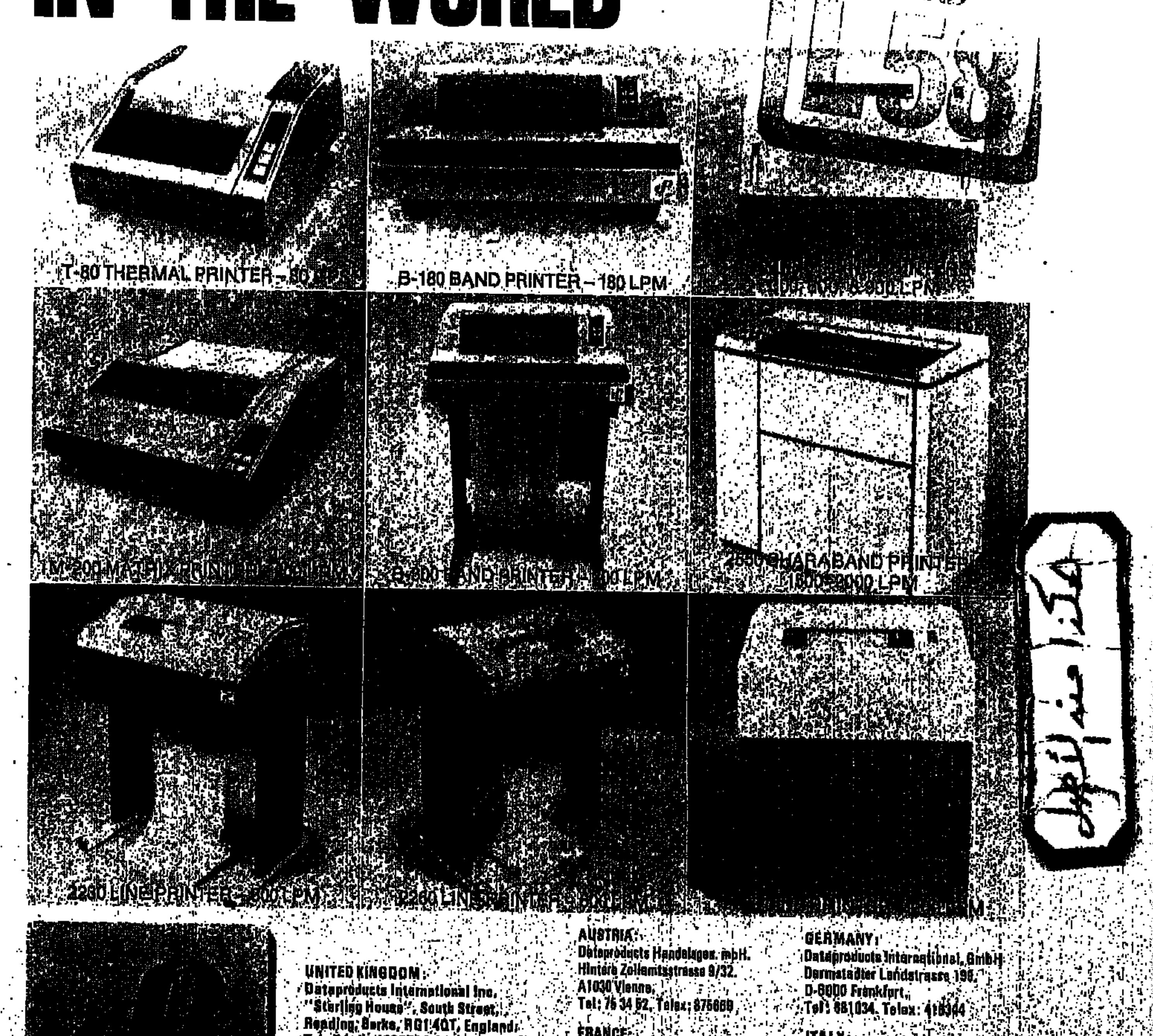


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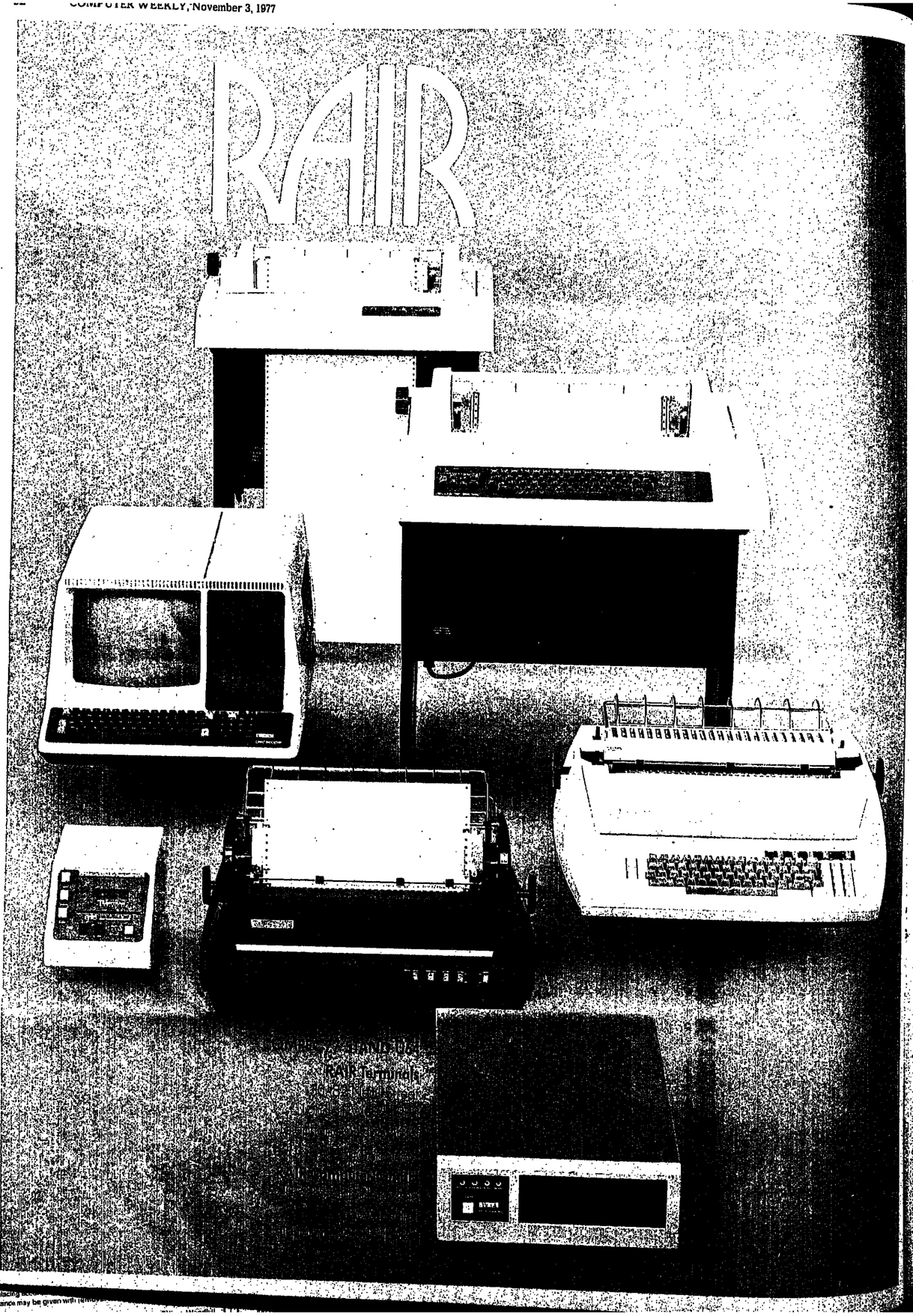


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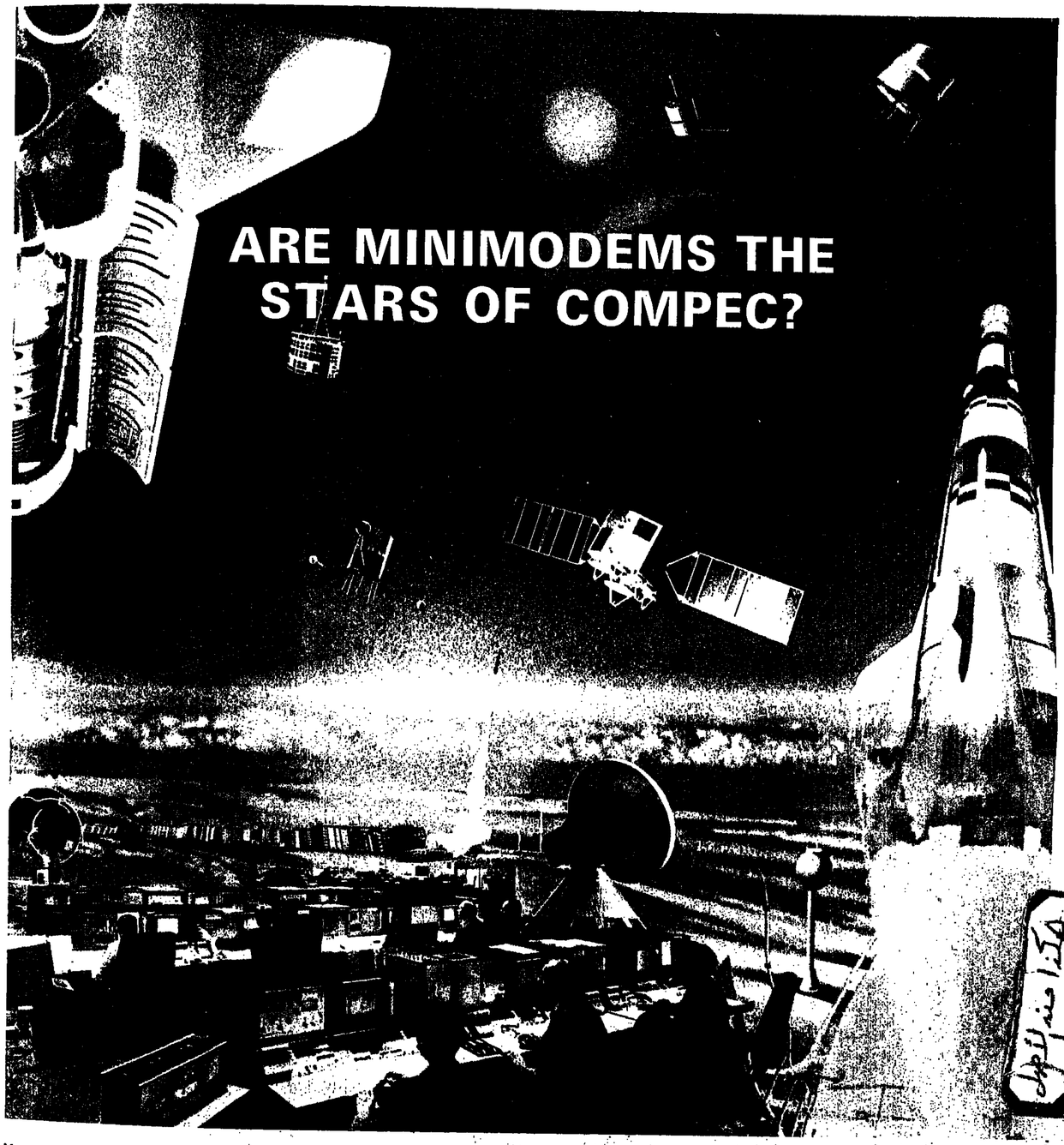


Many people in the industry think of Minimodems as the 'bores' in any system. Things that just sit there and go 'beep' in the night. They move data for all sorts of people; from the European Space Agency (to whom thanks for the picture above) to automatic greenhouse control systems.

Our range of data transmission devices and special interfaces has expanded to meet your needs and we are always ready to develop more novel solutions to your problems. When we get our first piece of equipment into space it will be due to you, our many and varied customers.

Meanwhile as a quiet thank-you to all our customers we will be giving away 200 tickets to a smash-hit sci-fi movie (whose name we're not allowed to mention). The 200 tickets will be distributed on a random and highly subjective basis to customers turning up at **Stand U.18 Compec 8th – 10th November.** Stand U.18 may not be the star of the show but, as usual, it won't be boring.

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BEVERLEY ROWE

*NEXT WEEK the study group on computers and survey analysis will hold a two-day conference in London on data structures and software for survey analysis. In this article, BEVERLEY ROWE of the Polytechnic of North London, who is chairman of the group, provides an overview on the software available for the social sciences. Computer Weekly will shortly publish a full list of all available packages referred to in the article.*

*The conference will be held on November 10 and 11 at the City University, London EC1, at a cost of £21 including pre-prints and lunch. Further details can be obtained from John Utting, National Children's Bureau, 8 Wakeley Street, London. The group is affiliated to the BCS and the Market Research Society.*

# Software for the social sciences

THINK of it: we have a register of between 80 and 80 items of software, each one costing from £10,000 to over £100,000 to produce (in real terms). The total value is upwards of £5 million depending on how you do the sums. Yet we find a turnover of between 5% and 10% a year. Two questions, then: Why so many programs for similar purposes? Why are systems discarded so easily?

I once thought people produced new programs entirely because they did not know what was already available. I now reckon this less important and give more weight to such factors as peculiar local needs of analysis and implementation and to commercial policies. But I still think that up-to-date guides to what exists are valuable to users and implementers alike.

If you are not involved with it, you may wonder why the area of social science computing is worth defining separately. On one side it merges into report generation and on the other side into general statistical software but the use of survey techniques in the social sciences and the sort of problems that arise give the software its own character. The use of cross-tabulation in analysis and the dependence on editing procedures are particularly distinctive.

Sampling human populations is not easy. Sampling methods can alter the results, so critical decisions based on surveys need to be confirmed and retested. Yet the findings concern people to whom both statistics and computers remain a closed book: advertising and marketing managers, civil servants and sociologists all need the results of surveys but may be disconcerted by even simple statistical techniques.

By the mid-sixties a great many survey packages had been developed and campaigns to chart their diversity were projected (see references 1-4). More recently, attention has been directed to evaluative programmes, particularly in the US.

Our own group, the Study Group on Computers in Survey Analysis, has directed its efforts at two levels. We have published a biennial series of listings of software commonly used in survey research in the UK. The 1973 and 1975 versions were published by the SSRC and this year's appears at the end of this article. The latest list will be published shortly in Computer Weekly.

At the same time, we have carried out a much more detailed study of 62 packages. These were all those known to us in mid-1974. This was reported in reference 3. With such a comprehensive study it is not possible to keep adding and deleting items, so it makes up in depth what it lacks currency. The conclusions in this article are based on this report and not on the 75 packages to be published soon in Computer Weekly.

Our own material is a little unusual, as we have strong links with the field of market research as well as with the academic world. Table 1 shows how the packages divide between "commercial" and "academic." It also shows the languages used in implementation.

Table 2 shows the distribution of the packages across machines. The virtual absence of commercial packages on ICL or CDC ranges is striking.

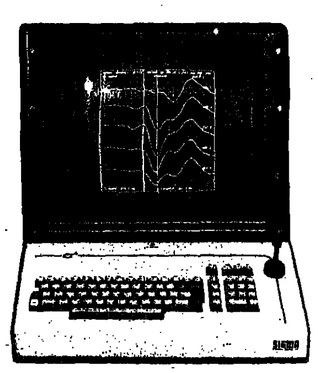
We identified these requirements for data input routines: input from: cards; magnetic tape; disc; paper tape; blank distinguishable from zero; zone punching permitted; recognises different character codes; no limit on number of "cards" per case; fixed fields not in card image format; multipunched columns.

Only two packages were positive on all these features: Editit, a commercial package since withdrawn, and RGSP from the Rothamsted Experimental station in Harpenden, Herts.

Multipunching needs a special word. A characteristic feature of surveys is the question with multiple answers. Ask "Which paper do you read?" and you receive any number of equally valid answers. It is inconvenient to record these as answers to a string of virtual questions: "Do you read the Mirror?" "Do you read the Sun?" etc. With a sample of 10,000 cases even one extra card per case increases data processing problems. This is why multipunching is such a valuable facility and is a feature of 23 of the 26 commercial packages but of only seven academic ones (out of 28). But

● Continued on page 35


## Graphic displays for the cost-conscious user



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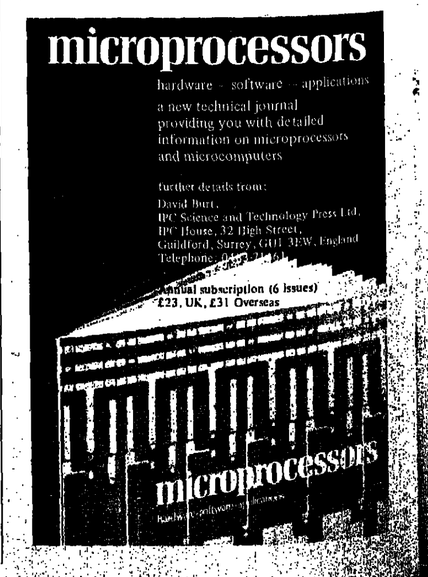





● From page 34

# Analysing survey data a particular problem

the gradual elimination of card input is altering this scene anyway.

The internal structure of records is more important than the details of input media. The main interest lies in what facilities are made available for non-rectangular data structures. Analysis routines almost always need a regular array of m observations on n cases but the natural format of a record can be very different. This irregularity is very typical of survey data and takes many forms:

*Filter questions* arise where questionnaires have sections to be completed or not, depending on the answer to a previous question. Thus:

*Q11 "Do you own a car?"*
*no (skip to Q20)*

That skip creates a blank in the record for all non-car-owners. If it is filled in with a string of "not applicable" codes, then in a heavily structured questionnaire storage requirements could be increased by 50% or more.

*Trailer records* are used if special cases need to have extra data attached to the main record.

*Missing records* can occur where subjects are seen more than once, or are keeping a diary. Then whole sections of records could be absent for a significant number in the sample.

All these are special cases of *hierarchical records*, although this term is used in practice to cover a specific type of structure. If all members of a household are interviewed, then some data will be common to all of them: address, household structure, etc. We then have two levels, household/person.

Each person can in turn be the source of a cluster of records (purchasing habits, travel, etc), or, going the other way, a household can be one of several in an area.

Half our commercial packages allow the user to manipulate non-rectangular structures of some sort but only one-sixth of the academic ones. The lack of such facilities in SPSS, from the University of Chicago, the most used academic package in the UK, has been a major problem for many researchers.

| | Academic | Commercial | Other | Total |
|---|---|---|---|---|
| Fortran | 21 | 3 | 1 | 25 |
| Fortran + assembler | 3 | 8 | 1 | 12 |
| Assembler | — | 11 | 4 | 15 |
| Other languages and compilers | 4 | 4 | 2 | 10 |
| Totals | 28 | 26 | 8 | 62 |

Table 1: Implementation languages.

| | Academic | Commercial | Other | Total |
|---|---|---|---|---|
| IBM 360/370 | 11 | 12 | 3 | 26 |
| ICL 1900 | 13 | 1 | 6 | 20 |
| CDC 6/700 | 15 | 1 | 0 | 16 |
| Other | 13 | 12 | 1 | 26 |

Table 2 Hardware implementation.

The range of a typical survey variable will normally include residual values such as the "not applicable" code already discussed, "value out of range," "missing" or "unknown," "don't know" or "answer refused." There should be standard names for these recognised by the system, and some packages claim quite a complex range of facilities in this area.

Collection of survey data involves many people, often working in difficult conditions. Checking and editing is a continuous process with this sort of research. But however much is done in the field or office, further automated data cleaning is essential. Most systems check that the data is set up properly and provide a selection of facilities to see that values lie in a specified range, items are mutually consistent (no 10-year-old parents) or that numerical items are consistent with *a priori* values (eg the relationship of height and weight).

The demands of fieldwork may impose a structure on data that is different from that needed for analysis. Most systems provide facilities for regrouping the values of variables in different ways and for doing different types of arithmetic transformation. Some packages (Ascop and Filan from ICL Dataskil, Fakad from Nuffield College, Oxford, Genstat from Rothamsted, Glim from the NAG library, SPSS and Comshare's Tactics) provide as many as 13 arithmetic and trigonometric transformations, although 13 packages have none. Only two packages (Glim and Filan) carry out all the transformations that we specified, but over half the packages go so far as to implement Fortran-like expressions for the transformation of variables.

And so we come to cross-tabulation procedures.

A typical table shows some variable of interest in the research — say, brand of petrol last purchased, or views on private education — within the groupings of variables such as class, age, sex, etc. Brand by sex is then a typical, simple, two-dimensional table. It can be elaborated in various ways. The number of dimensions can be increased: so we might have a table of brand by sex by class giving three dimensions. This would appear as a two-dimensional table (brand by sex) for each value of class. This can be generalised to n dimensions.

If you treat brand by sex and brand by class as separate tables it might be more convenient to put them both on one page (brand by sex and class) but this is still a two-dimensional table, as sex and class are being treated independently, not one within the other. Further elaboration would include percentages of various kinds and the ability to handle further variables within the cells of your table.

In general, then, we identified all these features as desirable: tables of at least four dimensions; percentages on grand total, page total, column total, and row total; extensive user control of output formats; default values for all options; multi-frame tables; high (or no) limit on number of tables defined; high (or no) limit on table size; table numbering; re-sorting of rows/columns; elimination of blank rows/columns; annotation options; automatic hyphenation of broken headings; manipulation of entire tables: combination, subdivision, arithmetic transformation, and reformatting; hole-count tabulation of multi-valued variables; table significance tests; explicit names for variables and values.

No package scores on every one of these points, but some miss out only three or four of the facilities listed: Donovan from Donovan Data Systems in New York; DRS Tab from Document Reading Services in Milton Keynes; Filan; MVSL from the LUCS bureau; Quantum from Denjohn Marketing and Computers Ltd, in London; RGSP; and SPS from CRC in London. Of these, only Filan and RGSP are available to academic users.

Survey data is often relatively underanalysed from a statistical point of view. This is partly due to the under-sophistication of its consumers, as I discussed earlier. It is also due to technical difficulties presented to the statistician: very complex sampling frames; sample failures (eg refusals to be interviewed); extensive missing data; very large files; coded and other non-real variables; non-rectangular data structures; and unusual distributions.

This is why the statistical section of our report is apparently quite superficial. We list thirteen items: sums; factor analysis; mean; time-series; standard deviation; analysis of variance; covariance; non-parametric analysis; quartiles; discriminant analysis; proportions; cluster analysis and regression.

No package bags the lot, but some score on most of them: PMMD from Nottingham University; Osiris from the Survey Archive, University of Essex; Nessa from the Nestle Company in Croydon; Survey 70/Statpack on IBM Call service; XDS2/3 from ICL Dataskil; BMD from the Universities of London and Newcastle; SPSS; SPS; Ascop; Fakad; and Genstat.

The difference between this list and the list of packages scoring high on tabulation facilities is marked. Only SPS is common to both, while almost all (apart from SPS and Nessa) are academic.

The systems divide evenly between having user specification in a free format, a fixed format or a mixture of free and fixed. There is a wide variation in the use of reserved keywords: almost half the systems have none, but two (Fakad and Filan) have 90 or more.

Fewer than half the packages allow the user to reference variables by name rather than number. (Imagine programmers' reactions to an assembler which did not allow names.) Even fewer (14) allow names for individual values of variables. In most cases, however, for both variables and values, names can be supplied for labelling output.

I posed two questions at the beginning and then ducked answering either. Everyone working in applications software will have his own ideas on why software proliferates; I claim no originality for my own views. We hope that to chart what exists is itself a concrete and useful step.


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# Intel micro division split into two

THE microcomputer division of Intel Corp in the US has been split into two separate operating divisions, handling systems and components respectively.

The formation of the two divisions is the result of what US sources close to the company have said were growing differences in marketing philosophy between systems and components operations in the old division. Certainly the marketing approach required to sell single board computer systems and related board products into a growing OEM market would require a radically different approach from that needed to sell even sophisticated components in bulk.

Bill Davidlow, formerly vice-president and general manager of the old microcomputer division, has been appointed general manager of the new systems division. Responsibilities for the new component division, which also used to come under the wing of Davidlow, have been placed on Les Vadasz, who was assistant general manager of the old division. Both managers now report directly to Intel president Gordon Moore.


**FORTRONIC (FIFE) LIMITED**

the Scottish electronics and bank terminal manufacturers are looking for agents to sell their advanced word-processing equipment.

During the week of Compec a demonstration unit will be available in central London and anyone wishing to discuss the possibilities should in the first instance ring 01-437 6288.


# Honeywell

● From front page

processors in a maximum Level 68 configuration.

In the second quarter of 1978 Honeywell is expected to market the Level 6-based Ultra Text word processing system, which was developed by US systems house Base Information Systems (CW, December 2, 1976).

A two-terminal system will cost from about $42,000 and will have a full networking capability with the large Level 66 systems.

A new Level 6/50 mini is also on the way which could match the power of the French-built Honeywell Level 64 line (CW September 29).

The emphasis on Level 6 is seen by some as a defensive move against possible nationalisation of CII-Honeywell Bull in France. Honeywell is further expanding its US small systems capability with the acquisition of Incoterm (CW, October 20).

## Gwent centre

THE Civic Centre at Newport, Gwent, is to be the next regional datacentre for BOC Datasolve. The centre has a staff of 24, an ICL 1902T system, and a data link to a remote ICL 7503 and 2903 in Pontypool.

**Keith Jones and Stephen Bell take a look at the new VAX-11/780**

A virtual memory addressing capability of more than four billion bytes enables as many as 64 users to interact simultaneously with the 32-bit Digital Equipment VAX-11/780.

# DEC 32-bit mini is PDP-11 compatible

MAIN targets for Digital Equipment's new 32-bit mini, announced last week (CW, October 27) are universities and colleges. And the manufacturer is also considering applications in the aircraft simulation and process control areas.

Hardware features of the VAX-11/780 include integral floating point and character string manipulation among the set of 243 instructions. To illustrate the efficiency of the machine's code generation, DEC points out that a Fortran DO loop translates into one instruction, while calls to subroutines and return to main program combine up to 15 operations in one instruction.

According to DEC one of the design goals for VAX was compatibility with PDP-11 machines and, to this end, the instruction set has the same mnemonics as the PDP-11.

Further compatibility with the PDP-11 is achieved with the Massbus interfacing adaptor on the VAX-11/780. This enables PDP-11 high speed peripheral devices like RP06 disc drives and TE16 magnetic tapes to be connected.

Other PDP-11 peripherals such as smaller discs, VDUs and printers can be connected via the Unibus interface adaptor.

DEC says that VAX-11/780 is not expected to impact the existing market for the PDP-11/70 because a VAX system will cost at least $30,000 more than a compatible 11/70 configuration.

Other significant hardware features of the VAX-11/780 include an 8K byte cache memory which achieves an effective memory access time of 290 nanoseconds. The main memory, which is made up of 4K MOS RAM chips, can be expanded from 128K bytes to two million bytes.

DEC expects to have the VAX-11/780 in volume production by the middle of next year but says that deliveries will start before then. The first year's production will be about 125 machines.

Continuing its rapid overall growth DEC recorded a total turnover of over $302 million (£170 million) for the first quarter of its current financial year that ended October 1. This compares with $204 million (£115 million) in the comparable period a year ago. K.J.

## Virtual memory operating system a prime feature

CENTRAL feature of the VAX-11/780 software is the operating system, VAX/VMS, the first virtual memory operating system on a Digital Equipment minicomputer.

The virtual memory concept is still rare in the minicomputer world as a whole. The economics of mini technology are only just beginning to make such complex software feasible on a mini from the performance point of view.

VAX/VMS is a multiprocessing sysem with provision for time sharing, batch and time-critical tasks. Task priorities are initially set at any of 32 levels, but the scheduling routine can adjust these to provide an appropriate mix of I/O-bound and processor-bound jobs in the machine at any time.

The memory paging strategy is unusual in that clusters of related pages can be brought into memory at one time, rather than pages being transferred singly.

The size of the "working set" of real memory allowed for a task can be adjusted by the user, but a maximum size is specified by the installation's system manager. He or she can also give the user the privilege to "lock" a time-critical task permanently into real memory.

Fortran IV and a powerful assembly language, VAX-11 Macro have been developed for the machine, but since it will operate with the PDP-11 instruction set as well as its own enhanced native instruction set, PDP-11 Cobol and Basic Plus are provided. Eventually, Cobol and Basic will be supported in native mode. S.B.


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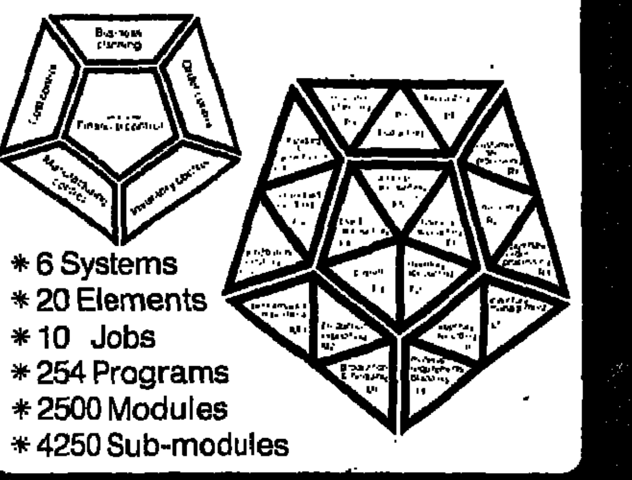

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Please send me your two booklets on MAS

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**CORAL 66 COMPILER FOR PDP-11**

The RMCS CORAL 66 compiler for the PDP-11 is obtainable with full maintenance and support from:

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# Appointments

LONDON 01-261 8484 · MANCHESTER · BIRMINGHAM · GLASGOW · BRISTOL


**Technical Authors W. London & Herts. £5,000**
Four manufacturing companies are looking for competent technical writers with mini or mainframe experience CW 44/5, Michael.

**Mini Computer Programmers to £6,950**
U.K.
Your experience is required now. A very large number of vacancies are registered where a knowledge of Assembler or communications experience is essential (VRC programmers would also be considered). Opportunities exist in S.W., N.W. or W. London, Surrey, Herts and Manchester in this exciting and rewarding field. There has also been registered some overseas posts to people with 5 or more years in mini computers. CW 44/1, Michael.

**Systems Consultants £6,000-£9,500**
CENTRAL LONDON
Seven large well-established consultancies wish to recruit systems people with all-round experience on third generation equipment and the right personality to deal with clients who require a first rate service. Technical communications consultants are also required where in-depth implementation experience of IBM or ICL T/P message switching networks, etc., are essential. Excellent fringe benefits and prospects CW 44/2, Michael.

**Contract Programmers to £190 p.w. U.K.**
Immediate requirements for IBM RPG II & IBM COBOL under DOS or OS for C. London, PL/1, OS or CICS, PDP/11 or good IMS for various locations for three months plus. Also IBM vacancies in Europe. Ask for the Contracts Officer on 01-995 2236. CW 44/3, Michael.

**Operators to Shift Leaders £2,000-£4,000 (incl.)**
LONDON & HOME COUNTIES
We have many vacancies covering all types of machines and locations. Some firms will retrain from one manufacturer to another. Remember these positions are for shift working only. Hurry whilst stocks last CW 44/4, Patricia.

**Hardware & Test Engineers £4,000 to £6,000 +**
HERTS. & MIDDLESEX
Seven companies situated around W. & N.W. London require first-rate Engineers who have mini or mainframe hardware design experience. Six vacancies also exist for Test Engineers with 16 bit and 32 bit mini experience and relevant testing background. Perks in some cases include a car and expenses. CW 44/6, Michael.

**Time Sharing Programmers to £6,000**
C. LONDON
If you have had time sharing experience involving the use of FORTRAN, BASIC or ASSEMBLER, then we have four nationally known companies who would offer you an exciting job in pre- or post-sales support. Some offer generous bonus schemes CW 44/7, Michael.

**Successful Salesmen to £12K quota earnings**
U.K.
We now have ten different firms for both hardware and systems only companies who are anxious to meet successful salesmen in this industry. They must have previous relevant small systems experience (some VRCs will be considered). All firms have bonus schemes and cars or car allowance. Most positions in S.E. England, but 2 in Midlands. CW 44/8, Michael.

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**Real-time Systems Engineers**
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Apart from competitive salaries & a variety of work, the positions offer a first-class working environment and the obvious advantages of working in Dorset.

For further information please contact John Nolan on 01-638 1891. Richard Owen Advertising, 56 Moorgate, London EC2R 6EL.

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**RESEARCH ASSISTANT IN DIGITAL SIMULATION OF BOILER TURBINE GENERATING SYSTEMS ACA/157/163**
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**Systems/ Applications Programmer**
£4,161 - £4,507 p.a. inc.

To produce and maintain systems and application software and offer a programming advisory service to staff and students at our Hendon location.

Applicants should be science/engineering graduates, or hold an HND in Computer Science; have had three years' relevant experience; be able to communicate effectively and have a mature approach to management activities. DEC System 10 experience an advantage.

Please write for full details and an application form, posting first class to: Appointments Officer (ref. 36,18), Middlesex Polytechnic, Bounds Green Road, N11 2NQ, to whom completed forms must be returned by November 14.

**Middlesex Polytechnic**



Datasolve Datasolve Datasolve

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**Programmers**
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Trying harder means giving more personal attention to any programmer looking for a new contract. If you'll be on the market soon, we'd be glad to try that little bit harder for you. Phone Richard Kaluzynski or Suzy Gillam on 01-491 4706 and you'll see what we mean.

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As long as you've been operating for 2½ years or more, we can fix you up with a contract that will lift your earnings and build your experience. One of the contracts on our books at the moment is almost certainly the one you're looking for. Phone 01-491 4706 and we'll tell you about it.

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**Operators- join the oil boom**
**to £3,500 Central London**
Oil Company with a big reputation as an employer needs three go-ahead young operators with at least 12 months IBM 370 experience – preferably under OS – to work a three-shift system in a rapidly expanding DP department. Good benefits, good prospects, easy travel – especially if you live south of the River.
Ref. AM/0044 **London**

**Shift Leader**
**£3,800 Surrey**
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**IBM OS experience?**
**Make it work harder for you**
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**Development programming**
**c.£3,500 Milton Keynes**
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**£3,300 now, with more to come Surrey**
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means welcome to Wales – to the DP department of a major electronics company developing a wide range of manufacturing and accounting systems. Salaries are negotiable, benefits include relocation expenses. The jobs look like this:

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**Senior Systems Analyst**
**material and production control**
To maintain existing systems and develop new manufacturing systems and associated software packages. You should have experience of real-time or time-sharing work, preferably for database applications.
Ref. B/062 **Birmingham**

**Systems Analysts**
Two vacancies, each concerned with new systems work in which on-line entry will play an important part. Experience of real-time, time-sharing or database applications is the main requirement.
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JBA

## Specialist Sales

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Our client, front line exponents of micro processor software, wish to appoint an experienced person to identify, approach, and sell to hitherto untapped micro markets.

The successful candidate will have had formal sales training, likely to be under 40 years, and with a track record in selling either d.p. services, products, or hardware. Previous employment with a semi-conductor manufacturer would be an advantage.

*First class products, generous salary, and superb prospects.*

Contact: Margaret Stevens

## Development Programmers

Hertfordshire up to £6,000

Our client, about to enter a new phase of software development for their products, are seeking to expand their team from trainee status upwards. All development work is in ASSEMBLER, incorporating mini-computers and, in the very near future, micro processors.

Applicants will ideally have a manufacturing background and a knowledge of one of the following: telecommunications software, key-to-disc systems, file enquiry systems, or mini operating systems.

*Attractive relocation package, salary, excellent prospects.*

Contact: Mike Creamer

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Central London circa £6,000

To join extremely interesting organisation developing statistical and information retrieval systems. The computer is an ICL 1902 with over 20 regionalised users.

Applicants should have at least 3 years' systems experience and have designed at least one major system. Also a programming background will be advantageous.

*Fascinating work, good salary, handy location.*

Contact: Mike Creamer

## COBOL Programmers

Home Counties up to £6,250

Our client, a large international organisation, has a requirement for several COBOL programmers to work on a sophisticated stock control application. Successful candidates are likely to have about 3 years programming in COBOL on a large mainframe, such as IBM, ICL or UNIVAC, in a commercial environment. Knowledge of a Codasyl type Database would be an advantage. This is an opportunity to use new and challenging techniques with a professional company.

*Excellent salaries and fringe benefits.*

Contact: Jim Baker

## Computer Engineers

Most areas £neg.

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Experienced computer field, sales, or support engineers are very welcome to call and discuss their requirements with us.

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Contact: Margaret Stevens

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West Country up to £5,000

Our client, a well established British engineering group, has vacancies for programmers to work on sophisticated and specialised real-time systems.

Applicants must have at least one year's experience of real-time applications on mini-computers using FORTRAN, CORAL or RTL/2.

*Salaries are negotiable. Excellent fringe benefits including relocation.*

Contact: Jim Baker

**For further information on any of the above vacancies please contact the appropriate consultant. If your qualifications do not match the above positions but you are seeking other opportunities please contact us anyway.**

JAMES BAKER ASSOCIATES
International Personnel Consultants
16 Maddox Street, London W.1. Tel: 01-491 4478



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This is an excellent opportunity for an experienced Computer Programmer/Systems Analyst looking to advance into DP management with a well-established manufacturing company based in the rural South West Midlands.

Data Processing Systems are well established but there is ample scope for additional development.

You should have at least 5 years' experience in computer programming and/or systems analysis. Experience in RPG II and/or IBM System 3 equipment would be an advantage.

Age 28+. Relocation expenses will be paid as required.

Contact:

**Ian Fyfe on 021-236 6971**
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THE COMPUTER CENTRE

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Further particulars may be obtained from the Personnel Officer, The Queen's University of Belfast, Belfast BT7 1NN, Northern Ireland. (Please quote Ref. 77/CW.)



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In all cases, a great opportunity to make your mark where it counts — the bottom line.

Please feel free to write to us enclosing a full resume, quoting the appropriate project number to: Mike Griffiths, Vice President, International, 7 Hereford House, 11 Ovington Gardens, Knightsbridge, London SW3.

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| OP | 135 DOS/VS GRASP | 3 shift, Mddx. | £3800 |
| OP | 135 DOS/VS POWER | 2 shift, S.E. Ldn. | £3600 |
| OP | 135 DOS/VS GRASP | 3 shift, City | £3900 |
| OP | 125 DOS/VS | DAYS & o/t W. Ldn. | £3900 |
| OP | 135 DOS/VS GRASP | 2 shift, BERMUDA | [illegible] |
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## ASSEMBLER PROGRAMMER

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We are seeking an experienced IBM Assembler Programmer keen to move to a Systems Programming role. This major IBM User is currently developing advanced database and network systems using the latest IBM software, and the new Programmer will receive extensive training in Systems Programming issues. Ideally you will have a minimum of two years' Assembler experience on IBM equipment, and preferably a working knowledge of OS, although a professional approach to computing with a commitment to the use of standards are considered equally as important.

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Candidates should offer on-line programming experience on IBM equipment preferably using System 3 and C.C.P.

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Please telephone for a confidential discussion or write to:
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**£120 per week**
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For further details contact:

DAVID WADE on 061-833 0676 REF. NO. CW/11/4

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## ANALYST/PROGRAMMERS

**Salary £3,800**
**+ Overtime**

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Our Clients, who are members of a well-known International Group, utilise the latest Honeywell hardware, and offer excellent conditions of employment in an area of the Wirrall that is well served with motorway and rail facilities.

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Computing Services Association

LOLA (London On-Line Local Authorities) provides computer facilities to a consortium of four London Boroughs. The Computer Centre is situated in modern offices at Enfield and current equipment is a 2-megabyte 370/158. On-line updating facilities are supported on over 100 remote VDU's with programs written in PL/1 running under IMS/360. It is intended to switch to IMS/VS by the end of the year.

# Systems Programmers

**£4,161-£4,900 and £5,044-£5,350**

These vacancies are in the section responsible for OS and IMS software support. Initial responsibility of the senior position will be in OS/VS1 support, whilst the junior post will be involved in monitoring performance particularly of the on-line system. A working knowledge of OS externals and JCL is required, together with experience in BAL or PL/1 programming. Opportunities for career development in both OS and IMS areas will be fully supported by all necessary training. For more information telephone Dave Goodall on Ext. 240.

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**£3,517-£4,243**

Applicants should have at least one year's experience of OS/VS1 (or comparable operating system). Preferably educated to 'A' level standard, but consideration will be given to those with 4 'O' levels, including Maths. AVAILABILITY FOR 3-SHIFT WORKING ESSENTIAL.

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**£3,695-£4,073**

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LOLA

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To control computerised projects from inception to the complete implementation with the minimum of supervision and to prepare feasibility studies, systems specifications, programming specifications and user manuals.

Ideally candidates should be aged over 25, with at least 3 years data processing experience in an industrial environment. Some programming knowledge would be an advantage but is not essential. The ability to liaise with all levels of Management is vital.

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To join a programming team designing and implementing an interesting range of factory and commercial and production factory systems using data base techniques. Candidates should have at least 1 years programming experience preferably in IBM COBOL.

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To assist our Computer Systems Staff to develop and implement a factory data base by investigating and documentating the use of coding systems and prime forms in procedure and user manuals. Duties will also involve the investigation and documentation of appropriate General Administrative practices and Factory procedures, as well as advising on the suitability of various office equipments, e.g. word processors. The successful candidate should preferably have similar experience and good communications ability.

We offer excellent conditions of employment, plus relocation expenses, of the sort you would expect from an advanced multinational in the late 1970's.

Contact immediately: Mr Alistair Budd - Personnel Officer, MEL, Manor Royal, Crawley, Sussex. Tel: Crawley 28787 Ext 364

MEL

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This re-configuration includes 3 × IBM 370-168 computers and an IBM 3850 (mass storage) running under MVS/JES3. We need Programmers to support the increased requirements of all areas of our business.

We would like to hear from Programmers who have at least one year's experience of working on a project and who are capable of producing good quality work to schedule.

The main language is PL/1 and where necessary we will train staff in that language.

A sound knowledge of JCL is desirable and IMS experience would be an additional useful qualification.

**AT LEAVESDEN**

Candidates with one year's programming experience preferably in PL/1 and a knowledge of data base techniques. We are currently operating a 384K IBM 370/135 installation under DOS/VS and POWER/VS.

**AT COVENTRY**

Preference will be given to candidates who have not less than two GCE 'A' level passes one of which should be mathematics and who have a working knowledge of IMS DB/DC DL/1 and COBOL language. The present equipment configuration comprises IBM 370/135 and [illegible]

Salaries and benefits, including re-location expenses, are as you would expect for a Company of our standing.

If you think you can interest us, please contact:

Mr J A J Clarke, Senior Personnel Officer
Rolls-Royce Limited
PO Box 31, Derby DE2 8BT
Telephone: Derby (0332) 42424, Extension [illegible]

Mr P Banton, Recruitment Officer
Rolls-Royce Limited
Leavesden, Watford, Herts WD2 7BZ
Telephone: Garston (09273) 70030

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ADM

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We have immediate requirements for:

## SENIOR SYSTEMS PROGRAMMERS

Successful candidates will have 3 years' experience in mini computer software, plus in depth knowledge of real time operating systems.

## D.P. INSTRUCTORS

Applicants must have a lengthy career in D.P. particularly in commercial system and programming. Structured programming and design experience is necessary.

## ALL D.P. PROFESSIONALS

A.D.M. is a steadily expanding consultancy with ambition, drive and direction. We need professional staff at most levels to strengthen and promote our already established image. Our staff enjoy the competitive salaries and generous fringe benefits befitting the consistently high standards demanded by our commitment to a host of important clients. If you feel your experience qualifies you for any D.P. post in our organisation, not necessarily described above, please come and talk to us on Wednesday, or contact us at our Harrow Offices as convenient.

## PROJECT LEADERS/ BUSINESS SYSTEMS

A strong business systems background of at least 4 years is essential, plus two years in commercial programming.

## A.P.L. ANALYSTS/ PROGRAMMERS

Candidates must have at least 1 year in commercial uses of A.P.L. and a further 2 years in D.P.

## COMMERCIAL/ANALYSTS/ PROGRAMMERS

You need 2 years' programming in a high level language, preferably COBOL, and some exposure to commercial systems design and analysis.

**Allan D'Morias & Associates Ltd.**
**60 High Street**
**Harrow-on-the-Hill**
**Middlesex HA1 3LL**
**Telephone: 01-864 9666**

# ASSYST

**c. £10,000 P.A. TAX FREE**

Jacquard Systems have recently appointed ASSYST as distributors of the J100 and J50 Videocomputer systems in the Gulf States and United Arab Emirates. To support and maintain this equipment ASSYST must fill the following vacancies immediately.

— **Senior Computer Engineer**
— **Computer Engineer**

The successful applicants will have a minimum of three years' experience installing and maintaining minicomputer systems including a full range of peripheral devices to component level. An understanding of operating systems software is also essential for the senior appointment.

Attractive tax free salary together with free accommodation (preferably no children) and full return fares paid for home leave form part of the benefits package for these appointments which are initially for a two year contract.

For further details of these interesting and challenging opportunities, apply in writing to:

**Mr. Norman Tinklin**
**Technical Services Director**
**Jacquard Systems Limited**
**Bridge Street, High Wycombe, Bucks HP11 2EL**
**Telephone (0494) 41266. Telex 83146**

Jacquard Systems

**NORTH WESTERN REGIONAL HEALTH AUTHORITY**
**REGIONAL ADMINISTRATOR'S DEPARTMENT**
**HEALTH CARE ACTIVITIES PROJECT TEAM**

# SYSTEMS ANALYSTS

(Three Posts)

**SENIOR ADMINISTRATIVE GRADE**
**Salary £3534-£4344 per annum**

**Plus a flat rate supplement of £6 per week and a 5% increase within the limits of £2.50 and £4.00 per week**

The above vacancies exist in this team which is developing Information Systems and Computer Projects for medical, scientific and administrative users throughout the Region. The development and implementation of both hospital and community-based health care systems is involved. The team, based at Gateway House, has access to an ICL 7503 front end processor and MOP facilities connected to the Authority's 1904S computer at Prestwich. A Wang 2200 desk-top computer is also available.

**Application forms and further details obtainable from the Regional Administrator, North Western Regional Health Authority, Gateway House, Piccadilly South, Manchester, M60 7LP, telephone number 061-236 9456 Ext. 425 and should be returned by 14th November, 1977. Please quote reference number 1446B.**

SOUTHERN ELECTRICITY

Applications are invited for the following post:-

# THIRD ENGINEER

**ENGINEERING COMPUTER APPLICATIONS UNIT**
**CHIEF ENGINEER'S DEPARTMENT, HEAD OFFICE**
**Salary within the range of £3,719-£5,500 per annum**

An additional Third Engineer is required in the Engineering Computer Applications Unit at the Board's Head Office due to the increasing work load brought about by a number of future projects including a computer based Telecontrol scheme, Plant and Circuits Files, etc.

The successful applicant will assist in a wide range of programming work including systems programming and the development of systems software.

Experience of writing programmes in high level languages is essential and a knowledge of system control languages would be an advantage. Training will be provided where necessary.

This post offers considerable opportunities to gain experience in a rapidly expanding area of the Engineering Department.

**Applications on forms obtainable from the Secretary, Southern Electricity House, Littlewick Green, Maidenhead, SL6 3QB, and return to him quoting 81/77 by not later than November 22, 1977.**

# Computer Operators

SCICON computer services require Computer Operators to work at their Milton Keynes Bureau.

The installation, housed in a purpose built computer centre, comprises twin Univac 1108 machines and an extensive communications network.

Candidates should have at least two to three years operating experience preferably on Univac equipment and be keen to pursue a career within an Operations environment. It is desirable that the applicants have been educated to 'A' level standard.

There is a four shift system in operation which covers seven days per week for which a generous allowance is paid.

Salary will be commensurate with experience and benefits are in line with other companies.

Please write or telephone for your application form to:

**Mr. C. FitzGerald, Scicon Computer Services Ltd.,**
**Brick Close, Kiln Farm, Milton Keynes MK11 3EJ**
**Telephone no. Milton Keynes 565656**

Scicon

# COMPUTER OPERATOR

**£2850-£3186 plus approximately £440 p.a. supplements, plus 12% shift allowance.**

Two Computer Operators are required to join an enthusiastic operating team at our Computer Centre in Bath.

Applicants should have 2-3 years' experience of computer operations, preferably in an IBM environment. Applicants with less experience could be considered for appointment within the salary range of £2442 to £2746 plus approximately £440 p.a. supplements.

The successful applicants will be expected to participate in the running of the Authority's computer which is linked to a number of terminals, including a key to disc data preparation section.

Preference will be given to local applicants.

Application form, including details of shift, are obtainable from Mrs. V. M. Gould, Personnel Officer, Wessex Water Authority, Techno House, Redcliffe Way, Bristol, and should be returned no later than Friday, 18th November, 1977. Please note reference number 271 & 11.

Wessex Water

**METAMEC CLOCKS LTD.**

Offer a Position as

# TRAINEE COMPUTER SUPERVISOR

In a rapidly expanding Computer Department, based on an ICL system 220 (120K). Excellent prospects for advancement. Full training given. Flexible working hours based on a 40-hour week. Pleasant rural setting (Norwich 16 miles). £2,750-£3,500.

THE APPLICANT TO BE

18-25 years of age. 5 'O' Levels. 2 'A' Levels. Willing and able to learn quickly. Prepared to live locally.

Apply with details to: J. E. Plumtree (Personnel Manager), Metamec Ltd., South Green, Dereham, Norfolk (tel. Dereham 2121).

SYSTEMS DESIGNERS LIMITED

# COMPUTING SYSTEMS CONSULTANCY

## SENIOR CONSULTANCY APPOINTMENTS SALARIES TO £9,000 PLUS BENEFITS

Systems Designers is a leading, and expanding, British systems consultancy specialising in mini and micro-computer applications.

Growing demand for our high quality service means we need top calibre consultants who will establish themselves as leaders in their fields. In addition to their consultancy and research activities, our consultants become involved in projects from the proposal stage and deal directly with clients. A degree of self-motivation is therefore essential, together with eagerness to extend company activities. There are opportunities to contribute to the extensive research programme, through which the company has a good record of attracting government sponsorship for important technological developments.

Head office is in Frimley, Surrey, and we have a nearby centre for the production of microprocessor systems and turnkey management. Our turnover in professional fees is in excess of £1M; we are a British private company with backing from the NEB. Excellent benefits and working conditions include profit sharing and a lively Sports and Social Club.

We are particularly keen to meet senior consultants who are already established in their fields, but will be pleased to discuss opportunities with any top professional able to contribute in our challenging environment.

### DEFENCE

We are currently providing computing consultancy support to the Ministry of Defence at the level of overall system definition studies through to implementation for very large and small air and ground defence systems. This includes work in the areas of system interoperability for integrated defence requirements, data link networks, distributed information processing, etc. We have challenging and creative career positions for qualified computer systems consultants who have worked in any of the above fields for more than six years.

### INDUSTRIAL CONTROL

We have posts available for senior computer software and systems consultants who have had at least six years' experience of introducing real time and control systems into industrial plant processes. We are looking for computing engineers who are aware of the problems of providing high availability, easily maintained systems in the harsh environments encountered in this field.

### SOFTWARE ENGINEERING

We require consultants and software specialists who have a deep understanding and interest in Software Engineering Techniques to work on current contracts we have in this field. Professional, qualified personnel are needed, conversant with software management practices, computer system design methodologies, structured implementation techniques, software verification programs and definition languages. Our current involvement is at the forefront of this high technology field.

Please write or telephone:

Alan Wheeler, Systems Director, at Systems House, 57-61 High Street, Frimley, Surrey, GU16 5HJ.
Telephone: Camberley (0276) 63471.

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LOTHIAN HEALTH BOARD — EDINBURGH

# SENIOR PROGRAMMER

**Scale 9 (£4528-£5503 p.a.) Inclusive of Phase 1 £312 and Phase 2 £208 supplements**

The Computer Services Unit requires a Senior Programmer to work on medical, financial and administrative systems.

Applicants should have several years' COBOL programming experience preferably on an ICL 1900. They must be able to communicate effectively both verbally and in writing, and be capable of leading a team of programmers.

The Unit is located at Board Headquarters in central Edinburgh and uses an ICL 1903T with tape and discbacking store, running under the GEORGE 2 operating system.

The NCC's FILETAB and FTL6 packages are in use and programmes are developed using the MAXIMOP system. Experience in any of these areas would be a further advantage to candidates.

For further details and application form, apply The Personnel Officer, 11 Drumsheugh Gardens, Edinburgh EH3 7QQ, to whom completed forms must be returned by 18th November, 1977, please quote reference LHB/0212.

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# ANALYST PROGRAMMER

**c. £5000** **Near Hampton Court**

Helena Rubinstein Limited, a producer of fine cosmetics, needs an experienced analyst programmer for the development of new and existing D.P. systems.

The person appointed would have RPGII experience gained preferably in a manufacturing environment.

Fringe benefits include a contributory pension scheme, a staff shop where our high quality cosmetics can be purchased at discount prices and a two course free lunch.

*Write in the first instance to:*

**J. E. G. Mathis, Personnel Supervisor**
**HELENA RUBINSTEIN LTD.**
**Central Avenue, East Molesey, Surrey**

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COUNTY OF CLEVELAND
COMPUTER SERVICES UNIT

# COMPUTER OPERATOR

**£3396 - £3774 (inclusive of supplements)**

An operator is required for the department's 370/148 Computer configuration and [illegible] work. This is a responsible post which includes [illegible] with "User" departments as well as central [illegible] and terminal operating. Part of the duties [illegible] implementing computer terminal installations and training the appropriate staff. Applicants [illegible] operating expertise and an ability to [illegible] fluently with others.

Application forms are obtainable from [illegible] Computer Services, Rede House, 67 [illegible] Middlesbrough, Cleveland.

**Telephone: Middlesbrough [illegible] 2351, to whom they should be [illegible] 11th November, 1977.**

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# INTERNATIONAL COMPUTER MANAGEMENT

## Home Base: Southern England
## Salaries: c. £8,500 p.a. plus mortgage subsidy and other significant fringe benefits

Our client, a large International Financial Organisation, is now establishing a series of computer installations in many parts of the world. The International Headquarters for this operation is based in an attractive part of Southern England, but job responsibilities will cover a wide geographical area.

### International Operations Support Manager

The successful applicant will co-ordinate the planning and installation of international computer sites. You will have responsibility for liaison with local contractors and equipment suppliers, and for deciding "where a computer room should go." You will be involved with the recruitment of local computer managers and will be expected to provide the necessary operations education on a local basis. You will also be expected to quickly gain the confidence of local users — the ability to adapt and get on with them is absolutely essential.

You will be responsible for providing guidance and "Headquarters support" for computer operations sites in operational locations. You will also be expected to train an Operations Support Team to provide the service mentioned in more than one site at a time.

We believe that the successful applicant will probably now be working either as an Operations Manager or a Systems and Programming Manager in a fairly large computer installation, and has already gained some experience in the physical planning of computer sites.

Ref: 925/CW.

### International Systems Manager

This position involves taking responsibility for the development, implementation and "on-going" support of our client's computer systems in a number of international locations. Project planning, man management, participation in systems design, user "selling" of the systems and maintenance of comprehensive standards are all a part of the job specification.

Candidates must have a strong financial systems and programming background and may well come from a banking or insurance environment. A sound knowledge of teleprocessing techniques and distributive systems would be a significant advantage.

Our client is looking for someone with around 6/7 years' data processing experience, who is used to controlling a group of professional staff working in a dynamic environment.

Creative thinking, up-to-date knowledge of hardware and software developments, the ability to communicate effectively with management and technical staff plus a quick reaction to the demands of a dynamic business are essential attributes. You will also be responsible for the maintenance of systems on an "on-going" basis and be expected to liaise closely with users and ensure that their requirements are constantly met and investigated.

You will have an enquiring mind, and will be an innovator who continually generates ideas to ensure that users' requirements are met.

Ref. 926/CW.

### International Manager — Research and Development

We are looking for someone to be responsible for the management of a group of Research and Development staff, working on projects dealing with new hardware and software products as they relate to our client's business requirements throughout the world. We want someone who can set up an evaluation testing scheme for new hardware to ensure that new developments in all areas are constantly assessed and related to our client's business. The thoroughness of these research programmes could well directly affect the security and reliability of our clients' International Centres.

You will be responsible for ensuring that a control is maintained over manufacturers' software used in their International Operating Centres, and also ensuring that new releases of such software are properly researched before recommending the worldwide implementation of these new releases on a co-ordinated basis.

You will be expected to recruit a technical research and development team of such calibre and experience that ensures the responsibilities mentioned are continually maintained.

We imagine that you could well be working for a mainframe or mini manufacturer — a software house, or a large user where your responsibilities already cover the evaluation of new hardware and software.

You will have a good understanding of business and must appreciate that user management may not have a high level of technical expertise to evaluate technical reports quickly. Therefore, you will be capable of producing reports clearly and concisely at a level that they can understand.

Ref. 927/CW.

All positions require a flexibility of attitude and a willingness to travel internationally at short notice. The ability to "get on" with users in many international environments is also vital.

The positions, open to both men and women, offer first class working conditions, generous salaries, excellent fringe benefits which, in addition to the mortgage subsidy, cover such things as a family medical scheme, plus a subsidised canteen.

Please contact John Goldsmith, quoting the appropriate reference number.

Computing Services Association

**WE ARE ALWAYS INTERESTED IN HELPING YOU WITH YOUR CAREER**
John Goldsmith (Computer Recruitment) Ltd., 15, Buckingham Palace Road, London, S.W.1.
Tel: 01-828 5356—24 hour answerphone service.

# JOHN GOLDSMITH (Computer Recruitment) Ltd.

# "MAKE A PROGRESSIVE MOVE"

## MIDLANDS

**SYSTEMS DESIGNERS** **c £5.000 p.a.**
**PROGRAMMERS** **c £4,500 p.a.**

Join a technically advanced Management Services Department who have a progressive computing policy, and are currently developing a wide range of interesting and varied projects.
You will be offered a secure environment, considerable scope for career progression, impressive training facilities, and large IBM equipment, utilising sophisticated software including IMS.

## — DO YOU HAVE? —

### SYSTEMS DESIGNERS

- ★ a sound technical understanding of systems design
- ★ two years + systems experience gained preferably in an IBM environment
- ★ both the ability and experience of maintaining user liaison

### PROGRAMMERS

- ★ 12 months + programming experience gained in the OS/IBM environment
- ★ fluency in either PL1/ASSEMBLER and/or COBOL.
- ★ IMS experience would be an advantage, although training will be given

The comprehensive range of benefits offered include: relocation assistance if necessary: discount on company products and training.

## Have you the experience and ambition?

Telephone CATHY TRACEY ON: 021-236 3781 REF NO CW/11/2

SCR

SPECIALIST COMPUTER RECRUITMENT LTD.
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**LONDON 01-935 0671 FREEPOST 6**
Freepost 6, 102, Blandford Street, London W1E 1JZ

Computing Services Association



JBA

**United Friendly is one of the leading Insurance Groups with its head office easily accessable by public transport. The organisation is expanding rapidly with Management committed to computing as the prime tool for operating and controlling the company.**

UF

**They utilise two ICL System 4 computers and are about to phase in a sophisticated ICL 2960. Expansion resulting from a large volume of work, together with further planned development, has created several vacancies for high calibre computing professionals.**

## DEVELOPMENT

**Systems Analysts** **up to £6,400**
A chance to engage in real creative development work utilising your commercial systems experience (should be at least two years). A previous programming background will enhance your abilities to handle all phases of systems work.

**Programmers** **up to £5,000**
Commercially minded COBOL programmers with upwards 1 year's experience on System 4 (or IBM) are needed to augment project teams. Unparalleled opportunity to get in at the start of a development project.

## TECHNICAL SUPPORT

**Software Programmers** **up to £6,300**
Programmers with extensive ASSEMBLER level experience and first hand knowledge of operating systems will be considered for these posts. The team is responsible for all software including the development and enhancement of the 5J and VME/B operating systems.

**Programmers** **up to £5,700**
Perhaps some of the most interesting work involves the transition phase to the 2960. Programmers here should ideally have at least 2 years experience on Sys 4 and USERCODE, together with a knowledge of COBOL and JCL. General emulation experience would be a definite advantage.

**Data Base Administration** **up to £7,000**
Systems Analyst/Programmer preferably with some knowledge of the Insurance industry and experience of the special analysis and design methods appropriate to the development and implementation of a data base.

**For further information on any of the above vacancies please contact Margaret Stevens.**

**JAMES BAKER ASSOCIATES**
**International Personnel Consultants**
**16 Maddox Street, London W.1. Tel: 01-491 4478**

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**COUNTY TREASURER'S DEPARTMENT**
**Post Reference: T259**

## Chief Programmer

**Salary £6,409 to £7,084, including Supplement**

The County Council operates a 192K ICL 1904S, in a George III environment, to provide services to all departments of the Authority. The Chief Programmer, who has direct responsibility for the control and supervision of a team of twelve programmers, must also be able to make a significant contribution to the preparation of development programmes and planning the longer term involvement of computer systems and techniques.

High level programming languages, including COBOL, FTL8 and Filetab, are used almost exclusively in the development of systems based on a comprehensive communications network.

Applicants should have considerable experience of the control of development resources, preferably in a local government environment, and should have a proven ability to develop and implement projects to a given timescale.

**Application forms may be obtained from the Chief Executive (Personnel), South Yorkshire County Council, Barnsley (Tel: Barnsley 88141, Ext. 268), and these should be returned by 18 November, 1977.**

**South Yorkshire County Council**
ENERGY IN ACTION

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**Amoco Europe Inc.**

## Programming/Analysis at a Senior Level

We are currently looking for a Senior Programmer/Analyst to join a group of professionals involved in various commercial applications in the areas of finance, marketing and administration. Our installation comprises an IBM 370/135 operating under OS/VSI with teleprocessing links to several European centres.

If you are interested in the 'why' as well as the 'how' of business and in the concept of following through a problem to its solution then we would like to hear from you.

You should ideally be a graduate with a good technical degree and at least 4 years' programming experience in COBOL and IBM operating systems. A knowledge of Mark IV would be a distinct advantage, but is not essential since training would be provided.

The starting salary will reflect the senior nature of this position and will prove attractive to those earning up to £5,500 p.a. In addition, we offer an excellent range of fringe benefits, including 4 weeks' holiday, 60p per day LVS and a contributory pension scheme.

*For further information, please contact: Brian McLintock, Amoco Europe Inc., 33 Cavendish Square, London W1M 3HF. Tel: 01-408 2195.*

AMOCO

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## RECRUITMENT CONSULTANT (SYSTEMS & PROGRAMMING)

### c. £10,000 p.a.

Datascene are probably one of the 'top five' computer recruitment consultancies in the country. We already have an extremely successful team of consultants working in a stimulating and rewarding environment.

If you have an outgoing personality, are aged between 25-35, have a proven track record of success in Professional Computer recruitment and management potential, we need you to join us in the Systems and Programming area. In a varied and fulfilling role, you will work closely with a client on assignments from start to finish: job specification, liaising on the design and composition of proposed advertisements, monitoring response, conducting initial interviews and presenting a short-list of applicants. Every encouragement will be given to create new business. The rewards are high — envisaged earnings in excess of £10,000 p.a., as well as profit sharing bonus. Other benefits include free PPP and the opportunity to grow with a rapidly expanding group of companies.
Find out more by telephoning Martin Grayson or Alan Dauncey. Or write to the address below.

**01-439 1856**
24-hour answering service

Datascene Limited
Sceptre House
169-173 Regent Street
London W1R 7FB

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UNIVERSITY OF LONDON COMPUTER LABORATORY

**TECHNICIAN**

Electronics and/or mechanical technician required for duties associated with development and maintenance of specialised computer peripheral systems used by members of the Computer Laboratory. The successful candidate will have a H.N.C. or equivalent and at least 7 years' experience. Salary to be in a range up to £3,500 p.a. Application forms from The Secretary, Computer Laboratory, New Museums Site, Pembroke Street, Cambridge CB2 3QG. Tel. Cambridge 356011 (24 hour answering service).

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# Software Engineers

01-361 2594 for recorded message of latest opportunities in U.K. and Europe, or write for information to: T. C. Kerr, STC, New Southgate, London N11 1HB.

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# ata Computer Recruitment

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**£3,000 - £5,000 p.a.**
**PLUS OVERTIME PAY**
**PLUS OPPORTUNITIES FOR TRAVEL ON WORLD-WIDE CONTRACTS**
**PLUS RELOCATION EXPENSES**

You will gain experience to widen your existing knowledge of low-level or high-level languages by working on a wide range of projects using minicomputers.

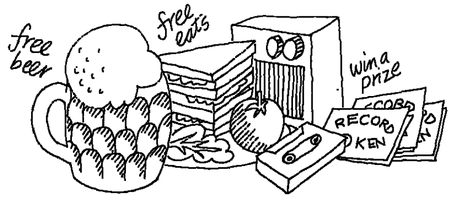
If you have a scientific or technical programming background, you qualify for an initial interview.

Once you have met our client, seen the working environment and realised the career advancement opportunities, you will want to join them.

**For further details, telephone our Crawley Office: 0293 514071 or your nearest ATA branch. Written application enclosing detailed C.V. to: ATA Computer Recruitment, 36 The Broadway, Crawley, Sussex.**

LONDON (01) 637 0781 — 230 Gt. Portland St., W1N 5HG
MANCHESTER (061) 832 5857 — 86 Cross St., M24LA
BIRMINGHAM (021) 643 1994 — Woolworth Building, 102 New St., B24HQ
BRISTOL (0272) 211035 — Equity and Law Building, 36/38 Baldwin St., BS1 1NR
EDINBURGH (031) 228 5381 — Anglia House, 24/26 Frederick St., EH2 2JR
CRAWLEY (0293) 514071 — 36 The Broadway

# Another Square One Open Evening




## An informal evening which could change your career

Are you a Programmer in PL/1 or other commercial languages, or a Systems Analyst? Are you ready for the challenges and the rewards of consultancy work?

If so, then you are invited to the next of the very successful Square One open evenings. We invite you to come along and have a chat over a beer and a sandwich, and take part in a competition with a cassette/radio and three record tokens as prizes.

Come and talk to us about a worthwhile career where skills and hard work really count. Our urgent requirements are for South London, and there are others over virtually the whole of the Greater London area.

Don't miss it. Square One are good people to work with, and we can promise you an informal but informative evening. (Listen out for our advertisement on Capital Radio this weekend.)

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**Open Evening**

**Monday November 7th**
**5.30-8.30 pm**
**150 Regent Street**
**London W1 (top floor)**

Square One Computer Services Ltd 02405 74161

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## Senior Systems Programmer

**Surrey** **C. £6,750**

The U.K. Group of a major international company having a 370/158 and 155 configuration, is expanding its D.P. commitment and needs a **SENIOR SYSTEMS PROGRAMMER** to take responsibility for generation, maintenance and support of existing and new software, tuning operating systems, bench-marking, guiding applications personnel, advising management and liaising with hardware C/E.

Future company plans include migration to 3031 mainframes, the use of VM/370 during 1978 and MVS in production by the end of 1978. The successful applicant will have a large part to play in both the planning and implementation of these objectives, and must have the potential to assume a managerial role.

Applicants should be self-motivating, able to communicate at all levels and flexible in their approach to the post. Minimum qualifications are "A" levels with experience of systems and operations, supported by a sound knowledge of JCL, BAL and high level language.

The company provides excellent benefits including help towards removal expenses where necessary.

We feel that this represents an excellent career opportunity for a successful Systems Programmer seeking to advance his career. Please telephone to discuss the matter fully with a Director. Quote ref. CW62-7B.

Computing Services Association

01-686 9693 (24 HOUR ANSAPHONE) | 061 236 2419 FAULKNER HOUSE
19 PARK STREET CROYDON CR9 1TN | FAULKNER STREET MANCHESTER M1 4YD

COMPUTER AND PROFESSIONAL PERSONNEL CONSULTANTS
**CAPP ASSOCIATES**
LONDON AND MANCHESTER

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## Computer Personnel International

110 St. Martin's Lane, London WC2N 4BH
Telephone: 01-836 6775

### NEW JERSEY, U.S.A.

**LONDON INTERVIEWS 14th-18th NOVEMBER**

For the first time you have the opportunity to join one of the most highly respected and professional software houses in the United States. Their growth is currently outstripping available resources so they are coming to London to meet Analyst/Programmers and Programmers with IBM O.S. Cobol backgrounds whose careers will benefit by experience in the stimulating USA environment.

The company employ approximately 160 professional staff throughout America and successful applicants will be based in the Head Office in New Jersey, but will be expected to undertake projects in various parts of the U.S.A. Our client will be interviewing candidates in C.P.I.'s London Office the week beginning November 14th, and they will provide a 50 slide presentation introducing the company to you. Rosemary Sarafian, who now runs our New York office, will also be available to give you guidance on accommodation, food costs, etc., in the U.S.A. The salaries offered are dependent on experience but will enable you to enjoy a high standard of living.

This assignment is exclusive to Computer Personnel International.

**To schedule an initial interview contact Linda Bensted or Marilyn Davidson on 01-836 6775.**

Real Time People | Computing Services Association | Computer Room People

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## Computer Systems LINSCOTT

### CONTRACTS

**U.K.**

Mini Computers Assembler CORAL Systems Engineers
Burroughs 1700 to 6700 COBOL Programmers
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PDP 1100 CORAL/RTL2 — RSX 11M
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IBM 370 COBOL OSVS1
IBM 370 Assembler Engineering/Scientific
PDP 1100 FORTRAN Macro 11 RSX 11M
ICL 1900 Plan G II
IBM 370 PL1 CMS CICS

**SWITZERLAND**

PDP 1100 Macro 11 RSX 11M

**GENEVA**

IBM 370 IMS Consultant
NCR NEAT (German speaking)

**FRANCE**
**PARIS**

Assembler Programmers — Software Specialists for new machine Development.

**We are always looking for permanent and contract staff, therefore if you want more information about any of the above U.K. contracts ring Stephan Trigg or for the overseas contracts ring John McLean on BRENTWOOD (0277) 212021. At the same time we can tell you about other requirements we have at present, which may be just what you are looking for. Alternatively send your C.V. to P.O. Box 74, Brentwood, Essex CM15 0BZ.**

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## G-PLAN c £4,000

### PL/1 Programmer

The makers of G-Plan furniture are seeking a programmer with at least 18 months' PL/1 experience to join a small team

The installation is a 370/125 operating under DOS/VS with POWER and we are currently implementing a trial T P Order Entry system under SHADOW/II

The successful applicant will be expected to show considerable initiative and work with minimum supervision

Apply, stating details of experience to

**Company Personnel Manager**
**E. GOMME LIMITED**
**P.O. Box 27**
**High Wycombe, Bucks.**

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## COBOL COMPUTER PROGRAMMING INSTRUCTOR £5,000 +

Why not put your programming experience to good use teaching others? Sound knowledge of Cobol programming is essential and previous experience in teaching is desirable. Make an appointment to come and see us by phoning Steve Grossé on 01-492 1841.

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## Free Lance Operators

Operators with experience of ICL 1900/George 3 urgently required for short to medium term employment in a large installation located in North Herts. Apply to Box Number 1905, Computer Weekly, Dorset House, Stamford St, London SE1

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## William Key

### Two years' good programming experience?

### Interested in working on DEC PDP-11 equipment?

Our client, based in the City, but with associated, and subsidiary companies in the USA and Europe, require for their London headquarters Programmers and Programmer/Analysts for both their commercial project teams, and the real-time software and T.P. development groups.

The company supplies software and hardware for real-time banking, MIS, and telecommunication systems, which are currently operational in 8 countries.

Applicants must have a minimum of two years' really good programming experience and should want to work in small self-disciplining teams on real-time systems.

The company offer comprehensive training, in-house testing facilities, a starting salary up to £5,500 and a 4-month re-assessment review, etc.

Ref. CW 9523

*For further information telephone Jenny Dalrymple-Hay on 01-493 2947 during office hours or Beaconsfield (04946) 4579 evenings and weekends.*

William Key & Partners Ltd., 4 Hall Moon Street, London W1
Manchester. 504 Corn Exchange. Corporation Street, M4 3DD

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## Software Programmer

**Interpreters ✳ Compilers ✳ Operating Systems ✳ Micro-computers ✳ Mini-computers ✳ Communications ✳ Word Processing**

KPG has a growing small in-house development section working on projects involving many of the above fields. We are looking for a Software Programmer with around three to four years' experience, possibly gained with a manufacturer or software organisation, relevant to at least one but preferably more of these activities. The section has it's own development computers and associated equipment. There is plenty to do so if you enjoy this type of work and do not mind putting in the hours to get the job done call Lew Gray or write to him giving brief details of what you have done to date.

KPG
**580-586 Chiswick High Road, London, W4 5RP.**
**01-995 3573.**

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## DatasolveDatasolve

# Join an exciting new Datacentre development programme UK and Overseas

BOC Datasolve is a fast growing, customer orientated computer services company and we are already the largest independent organisation of its type in the UK. With the ever increasing demand for our range of services and products both at home and internationally, we are now engaged in a vigorous and imaginative programme of regional development aimed at providing a network of Datacentres throughout the country to provide an even higher standard of service to our clients in commerce, industry and the public sector.

Our range of in-house hardware is impressive to say the least. In our main London production centre in Oxford Street, we have a multi-processor consisting of two IBM 370/158's, while at our Sunbury-on-Thames headquarters, we are at present supplementing an ICL 2970 configuration, the first ever to go into a bureau operation, with a further IBM 370/158 plus a compatible, highly sophisticated installation which will be linked to it as a multi-processor.

With the updating and expansion of our regional services, we are looking for men and women to fill the following appointments, all of which offer considerable scope in an environment of advanced computer technology.

### Operations Controllers

To manage the day-to-day operations of several Datacentres including data preparation and control, operations, systems and programming. At least eight years' DP experience is required including familiarity with all aspects of a computer installation and preferably a minimum of three years' bureau experience and knowledge of ICL 1900 series equipment.

### Regional Controller

To be responsible for the overall management of a group of Datacentre production facilities in the South of England and West Country with emphasis on meeting budget objectives and maintaining high levels of service and efficiency. Significant operations or bureau management experience is required, preferably including ICL 1900 equipment.

Salaries for the above positions will be in the range of £6,500–£8,500. A company car will be provided as appropriate.

### Consultants

Consultants are required to undertake projects in support of our Regional Development programme particularly:

- Operational and administrative audits of Regional Datacentres.
- Technical and financial evaluation of potential Datacentre sites.
- Hardware and software evaluations and comparisons.
- Development of services and products on existing sites.
- Evaluation of market requirements and potential in the UK and Overseas.

A degree or equivalent qualification is desirable together with broad experience of commercial data processing with a computer services company or computer manufacturer. Thorough familiarity with financial control systems is essential and experience gained in a sales/marketing environment would be an advantage.

Salaries for these positions will be in the range of £7,000–£9,000. A company car will be provided as appropriate.

### Sales Executives
### Facilities Management

Successful and ambitious computer Sales Executives are required to assist in our sales expansion programme involving the establishment and development of new Regional Datacentres, particularly in the Midlands, the North East and East Anglia. Proven sales ability coupled with DP applications experience is essential. Experience gained in negotiating major hardware/service contracts particularly on IBM or ICL equipment is desirable. These senior positions offer an exceptional opportunity to play a key role in the development of Regional Datacentre operations.

A highly competitive remuneration package will be offered and a company car will be provided.

BOC Datasolve

Written applications for these appointments should be made to: Alan Burton-Jones, Regional Development Group, BOC Datasolve Limited, Shipton Group House, 24 Oval Road, London NW1 7DD. Telephone: 01-267 6157.

18 Bedford Row
London WC1R 4EB
01-242 9356
Telex 24120

occ

Specialists since 1971 in UK and international computer appointments

# occ computer personnel limited

## READING and LONDON and OVERSEAS

***Our client is a Software House with an established market in the U.K. and Overseas. We have listed below a number of positions based in London, Reading or Overseas. The vacancies have been created by expansion and offer opprtunities for work on site, at customers' premises, as well as in-house project work. All the vacancies at the Computer Centre are based in Reading.***

### ● 1900/2903

**Programmers** Up to £6,000

Opportunities exist for all grades of programmers with either a software or an applications background. They would be based in the UK, however there are possibilities of short and long term contracts overseas.
Candidates ideally would have two years' experience on 1900 or 2903 systems together with a working knowledge of COBOL or PLAN or RPG II.
An application background should include commercial or financial or manufacturing systems. Alternatively those with real-time programming experience, or a background associated with the maintenance of operating systems or communication systems, or compilers, would be most attractive.
The work could involve on-site projects based in a customer's environment. Alternatively there will be in-house development of applications packages or the maintenance and support of operating systems.
The right candidates will have the opportunity to train on new machines and to learn new languages. **Ref. 578S/CW.**

### ● 2900 SYSTEMS

to £8,000

There are a number of vacancies for 2900 experienced staff at all levels for Applications and Software support programmers as well as systems analysts.
All candidates must have a strong programming background and must be suited to work in a customer environment. We are equally interested in COBOL programmers and technical staff who have worked on software support and have experience of VME/B, VME/K or IDMS.
Systems applicants must be able to study and define systems requirements for large 2900 users in order to design special systems. This will include proposal writing and implementation. Senior candidates should have been involved on the successful implementation of at least one project from design to installation. **Ref. 573S/CW.**

### ● Technical Manager

to £6,000

A Computer Centre housing a number of mainframe installations provides a machine time service and is based in Reading.
There is a vacancy for a Manager who will have responsibility for forward planning as well as administration of main computer site and satellite installations.
We are looking for a technical man with a background in engineering and/or operations who has had supervisory experience. This person should be able to deal with basic budget and accounting matters as well as problems associated with the installation of computer equipment. **Ref. 579S/CW.**

### ● Salesman

A salesman with an operating background is also required to sell machine time. A salary plus commission plus mileage allowance will be offered. **Ref. 581S/CW.**

### ● Programmers

**System Ten & System 1500**

to £7,000

Vacancies exist at various levels ranging from Programmers to Project Managers, for experienced ICL SYSTEM TEN or SYSTEM 1500 personnel.
REAL TIME PROJECTS in London and other UK sites offer opportunities to ASSEMBLER Programmers with several years experience, including a minimum of 1 year on systems ten or 1500. A project deals with a Hospital application and another with a Building Society system.
SOFTWARE DEVELOPMENT for communication system network will give software candidates a chance to progress in that field.
We are also interested in senior candidates who have been involved in the successful implementation of a number of projects and can assume a supervisory function as Project Manager or Team Leader. (In some cases the salary negotiable is in excess of the salary quoted, if justified.)
The above positions are based in West London or Reading with opportunities to work overseas. **Ref. 577S/CW.**

### ● Scientific Oriented Programming

£3,000-£6,000

The vacancies are based in Reading, with opportunities to work on site in the UK and overseas.
Candidates must have a science based degree or an equivalent qualification as well as several years' systems and programming experience, preferably on ICL hardware.
All applicants must be well spoken and presentable with an awareness of a customer environment. **Ref. 576S/CW.**

### ● Operations

**Team/Shift Leaders**

From £3,000 + s.a.

**Salary negotiable depending on experience.**

There are immediate vacancies for experienced 1900 George 3 staff. A three shift, 5-day week system is involved for which a 20% shift allowance will be paid on top of the salary. **Ref. 580S/CW.**

### ● Technical Support

The Computer's Centre's Technical Support Team has a continuous requirement for skilled technicians with experience of 1900 George 3 and/or 2900 VME/B. Average salaries for technicians are around £4,000. Exceptional candidates with experience of 1900 and 2900 could earn up to £6,000. **Ref. 582S/CW.**

***To apply for any of the above positions or for further information, please telephone or write to Renée Nute and Sandy Lloyd on 01-242 9356. If it would be more convenient to telephone in the evening, the telephone numbers are: Renée Nute: 01-874 6372. Sandy Lloyd: 01-691 5168.***

Member of Computing Services Association

18 Bedford Row
London WC1R 4EB
01-242 9356
Telex 24120

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Specialists since 1971 in UK and international computer appointments

occ computer personnel limited

### ● Kent

**Senior Analyst Programmer**

£4,500 to £5,000

**ICL System Ten R/T system. Potential number 2 to DPM. Excellent career opportunity to grow with expanding department.**

The System Ten is vital to the operation of this company which deals with subscriptions to magazines and journals on an international basis. A second machine is likely to be introduced to broaden the scope of applications. The person appointed will take charge of the programmers, structure and program systems, develop and implement standards, and maintain the software. Candidates will probably be about 25, with a minimum of 2 years' System Ten Assembler experience. The company is located in a pleasant seaside town and the working atmosphere is relaxed and friendly. **Ref. 729/CW/Neville John.**

### ● Bedfordshire

**Analyst/Programmer**

to £4,500

**Real Time inventory control system on PDP 11**

The worldwide marketing division of a major engineering group operates IBM 370 hardware (DOS), and a PDP 11. On-line applications including order processing, invoicing and despatch, are now running and a R/T stock control system is being developed for the PDP 11.

An Analyst/Programmer is urgently needed to help the Project Leader to investigate, design and implement this new project. The person appointed will supervise and participate in the programming effort.

A sound Cobol programming background with a knowledge of IBM 360/370 equipment, operating under DOS is required. Some knowledge of PDP 11 under RSTS and Basic Plus would be an added advantage, although full training on PDP-11 hardware and software will be given. This is an excellent opportunity to get involved at the start of an interesting project. **Ref. 731/CW/Marian Tabone.**

### ● Herts

**Senior Systems Programmer**

£6,000

**Executives — Operating Systems — Telecommunications**

Our client is a Computer Manufacturer with a well established market in the fields of mini computers and satellite computer systems. The software development organisation has a requirement in the design department to work on special design products. The major projects deal with EXECUTIVES, OPERATING SYSTEMS AND TELECOMMUNICATIONS.

We are looking for a person with a Real Time Software background who is able to deal with the problems of software interfacing at a low level with hardware. Assembly programming experience should include testing and is essential. A qualification in a scientific subject, engineering or computer science is highly desirable.

The position offers responsibility for the development and enhancement of company software products within the above mentioned areas. Ideally the successful candidate should have the ability to progress to Project Leader status after a short while. **Ref: 583/CW/Renée Nute.**

### ● Software Sales

**Marketing Representatives**

c £9,000

Our client is TSI International Ltd., who have sole responsibility for the U.K. marketing, sale and support of TASK/MASTER, the most widely installed independent TP Monitor for IBM 360/370 machines. They currently have need of two marketing representatives, primarily to promote the sale of TASK/MASTER, but also to sell other related products in the area of turnkey communications systems, text editing, program development packages, etc.
Candidates, preferably aged 25-35, should have a good educational background and a proven sales record in the IBM software market. Alternatively, candidates with an in-depth IBM software background, and with the necessary personality, drive and initiative to move into sales, will also be considered. In either case knowledge or experience of Teleprocessing Software such as CICS, Shadow, etc., would be a considerable advantage, as would the ability to speak at least one other European language.
The company offers excellent conditions of employment including free BUPA and life assurance, profit sharing and very generous travel allowances. **Ref. 434/CW/Sharon Matthews.**

### ● Minis

**Real-Time Programmers**

up to £6,000

**Berks/Essex/Herts/Surrey**

There are opportunities at the above locations for people with mini or micro computer experience.
Applicants should have at least 2 years' Assembler real-time programming experience based on mini computers. In addition a systems or engineering background would be an advantage.
Our clients are well established mini computer manufacturers. The work will involve dealing with the installation or support and maintenance of systems on-site within a customer environment. In some instances, it may involve training customers' staff. Alternatively it could involve in-house development of special software for the enhancement of existing systems or new products.
The mini-market is constantly expanding. Prospects could lead into sales for support candidates particularly suited to working with customers. Equally good opportunities exist for programmers anxious to progress in a production environment. **Ref. 101/CW/Sandy Lloyd.**

### Contracts Abroad

*Renegotiable contracts for initial periods of 12 months+ will be offered. In the Middle East preference will be given to single candidates or those married with no schooling commitments.*

**Middle East**

c $30,000 Tax Free

**Univac based systems — major development projects**

Data base Designers with design and implementation experience of D.B. systems are required to assist with development and provide technical advice in these areas. Operating Systems Specialists with a sound knowledge of EXEC 8 software are also required.

**South Africa**

c $30,000 Tax Free

**I.M.S. Data base systems development**

3 Senior Systems Designers are required for major data base projects, for implementation in an I.M.S. environment. Logical data base design experience is essential, preferably including some time with I.M.S. based applications. **Ref. 351SM/CW/Roger Allington.**

### ● Germany

**Compiler Development**

c £13,000

**Designers and Programmers — permanent positions with a major German software house**

Our client, a highly successful and long established German software house, is looking for several software specialists to work on compiler development projects.

Candidates should have experience in the area of compiler development, preferably having worked on at least one such project from design to implementation. COBOL compiler experience would be of particular interest, but other languages will equally be considered. Candidates must be prepared to relocate to Germany and work within small teams operating in a multinational environment.

These are permanent positions offering excellent career prospects and remuneration. Salaries in excess of the figure quoted above could be offered to exceptionally well-qualified candidates able to fulfil a project leadership role. **Ref. 415/CW/Sharon Matthews.**

### ● Brussels

**Designer Programmer**

c £7,000

**MICRO COMPUTERS; young electronics/electrical graduates with 1-2 years' experience**

A well established engineering consultancy in Brussels provides technical support to users of MICRO circuits throughout Europe, and also designs and manufactures an extensive range of hardware based on micro computers, for use in control systems. It now needs an additional designer/programmer to join the team developing Software for these systems. Recent graduates in electronics or electrical engineering with experience in these fields, gained wholly in an academic environment, or with 1 or 2 years' post-graduate experience in industry, would be suitable. English is the working language. This is an excellent opportunity to join a young, expanding company, working on the frontiers of modern computer technology.
Please ring NOW to discuss this and to arrange an interview with the client. **Ref. 407/CW/Neville John.**

### ● Benelux & Germany

**Consultancy Opportunities**

£8-15,000 + benefits

**Communications, IMS, Software, Control Systems**

There are currently a large number of opportunities at various levels and locations for candidates wishing to work abroad on projects offering challenge and high job satisfaction. At least 3 years' experience is required, and for the more senior positions, this could be 7 years including some time in a supervisory role. Specific areas of interest include:—

- ★ Basic Software
- ★ Communications
- ★ Data Base Design
- ★ Message Switching
- ★ Mini based Systems
- ★ Telex Switching
- ★ Process Control
- ★ Networks

Dutch or German Nationals with other D.P. experience could also be of interest. Education to 'A' level standard desirable. Attractive remuneration packages will be offered and in some cases, company cars will be provided. **Ref. 369/CW/Roger Allington.**

***To apply for any of the above positions or for further information, please telephone the Consultant concerned during working hours on 01-242 9356, or write to the above address. If it would be more convenient to telephone in the evening, the telephone numbers are:***
***Neville John — Farnborough (Kent) (66) 52017. Roger Allington — Berkhamsted (04427) 2299. Renée Nute — 01-874 6372. Sharon Matthews — Billericay (02774) 22351. Marian Tabone — 01-656 6868. Sandy Lloyd — 01-691 5168.***

Computing Services Association

# 5 Senior Computer people still required *urgently*

***Salary* negotiable**
**Not less than *£6000***
**plus a generous benefits package**

With experience of
- 2 manufacturers hardware • Programming • Systems Analysis

Must be
- Adaptable • Ambitious • Self-motivated • Car owner

Will get
- Varied work involving Systems and Programming skills
- Management Training • Opportunities for career development

Applicants are likely to be 20-40 years of age. For further details of these vacancies and our staff policy which includes
- **Promotion from within • Share Scheme • Staff involvement**

Telephone: Barbara Clark
CMG (Southern) Ltd
Sunley House
Bedford Park
Croydon CRO 2AP
01-686 8251

CMG
*London · Amsterdam · Frankfurt*
*Rotterdam · Brussels · Glasgow*



## CITY

We have been retained by our clients a highly professional organisation with worldwide activity to fill the following positions. The company uses an IBM 370 158 with Disk Drives Magnetic Tape Drives Line Printers and other ancillary equipment

### SYSTEMS ANALYSTS — To £6,800

You will join a team working on a group of projects concerned with accounting operations such as payroll, pensions and management information. Reporting to a Project Leader you will assume full responsibility for some of the existing facilities whilst also developing new ones

Four years' systems experience is required together with a sound technical ability and competence at producing specifications. Knowledge of financial systems useful

### PROGRAMMER — C. £5,000

This is a challenging position for someone keen to show initiative and get totally involved at all levels of the programming function. You will assist user departments, test and evaluate prototype database designs and assist in the evaluation of new software products

Applicants must have at least two years' COBOL and/or ASSEMBLER on IBM 360/370 running under OS

To apply for the above positions or any other positions to suit your experience and locations please telephone for an Application Form

**AMES PERSONNEL**
TELEPHONE: 01-767 0611



**£6.25K INTERNAL CONSULTANT S/A Suffolk**
This is a newly created position to act as part of a team trouble-shooting, advising, co-ordinating services to 5 divisions throughout the U.K. Sound business background essential

**To £5.5K SYSTEMS ANALYST Staffs**
Required to take responsibility for the day to day running of the systems development department. The successful applicant should have at least 3 yrs systems experience. (Company upgrading their ICL 1900)

**£4.5K JUNIOR ANALYSTS London EC**
No programming is required for these positions but as databases to overseas locations are anticipated some DP experience useful. Commercial systems Bonus & other perks.

168 Finchley Road, London, NW3 6HP

COMPUTECH 01-794 0202



THE UNIVERSITY OF LANCASTER

## SENIOR SYSTEMS ANALYST/PROGRAMMER

Applications are invited from suitably qualified men or women for an appointment in the Data Processing Unit in the University Administration.

The installation comprises of an ICL 2903 with EDS 30s, VDUs and a link to a NOVA computer in the Library.

At least 2 years' programming experience including the use of COBOL is essential and a knowledge of ICL software is desirable.

Salary scale: £2904-£5627 (under review). 26 days' annual holiday plus statutory holidays.

**Further particulars may be obtained (quoting reference L.4B) from the Establishment Officer, University House, Bailrigg, Lancaster LA1 4YW, to whom applications (five copies) naming three referees, should be sent not later than 14th November 1977.**



## SENIOR ANALYST/ PROGRAMMER

An excellent opportunity exists for an experienced Analyst/Programmer seeking additional responsibility and career progression within a challenging commercial environment

The successful candidate will probably be earning in excess of £4,000 per annum and is required to join a small department initially developing a unique ON-LINE data-base order processing system

Applicants should have at least 4-5 years' programming experience in both COBOL and ASSEMBLER and preferably already have worked on the analysis and design of a major commercial application. ON-LINE programming experience is essential and a knowledge of any data-base management system would be a distinct advantage. We are also looking for proven ability in staff supervision

The Company is located to the north-east of Derby within easy reach of the Derbyshire peaks and all re-location expenses will be met

Apply in first instance to Personnel Officer, William Hollins & Co Limited, Viyella House, Somercotes, Derbyshire.

VIYELLA



## If you like the sound of us

We started in computer services five years ago, just four of us. Now we're five times bigger, still growing, working throughout the UK and Europe — consultancy, turnkey systems, software, contract services.

Our increased size hasn't made us less human. People like working here. Maybe because we give every opinion a chance. Try always to do a good job better, and we pay well for those who think the same way.

## And this sounds like you

**Systems analysts.** (We need three).
Your background includes planning and implementing commercial systems, preferably using TP and/or Database disciplines.

**Analyst/Programmers** (We need 2).
You have thorough knowledge of IBM 370, preferably in an Assembler or PL1 environment.

**Senior Programmers** (We need 4). You're experienced in two of these four languages: Assembler, COBOL, RPG, PL1.

If you're right for us, we'll top whatever you're earning now. If you want to be with an energetic company that can only go ahead.

## Get in touch

**Hill Price Davison Ltd, Waltham House**
**Walham Grove, London SW6 1QP**
**Telephone: 01-381 3266**





# SOFTWARE DESIGN AND DEVELOPMENT

**The use of mini-computers and microprocessors is spreading rapidly, generating exciting career opportunities for software people. One of the fastest growing application areas is in the real-time control of complex automated systems for various industrial processes.**

**Our client is a British company, long established internationally in the forefront of its chosen field. Their organisation embodies a Software Design Department, which undertakes the design and development of standard systems software, language facilities and compilers, as well as advanced application packages. These are used by application groups to build custom automation systems.**

**Increasing new product development and business expansion have generated interesting career vacancies.**

**Located in very congenial conditions in the Northern Home Counties, these vacancies represent an excellent opportunity for career development in one of the most exciting and fast developing career sectors of computing today.**

**Terms of employment include an excellent Superannuation Scheme, 4 weeks' holiday, free life assurance, subsidised restaurant and sports/social facilities. Where applicable, relocation assistance is available.**

## TEAM LEADER - CORAL £NEG

**A Senior Software Designer, with 5/6 years' mini-midi experience mainly on compiler development (especially Coral, Fortran, Algol, Pascal, RTL2), is required to lead a team responsible for the continuing development of a CORAL compiler, including the design of major enhancements and the design and implementation of supporting software.**

RW44/1

## TEAM LEADER - Interactive Languages & Support £NEG

**Responsible for the detailed design of interactive language systems, assemblers, linkers, etc., this Team Leader will probably have 4 years' experience on "systems" software, including interactive languages. He/she will currently be functioning as a team leader and will also have knowledge of compilers or real-time operating systems, or other relevant areas.**

RW 44/2

This is primarily a technical role, but team leading ability is also essential.

## SENIOR SOFTWARE DESIGNER - CORAL Up to £7500 p.a.

**Reporting to the Team Leader — CORAL, the Senior Software Designer will be responsible for detailed design and implementation of sections of the CORAL compiler.**

**Candidates will have some 3 years' relevant experience, of which some 50% should have been on minis.**

RW 44/3

## SOFTWARE DESIGNER Up to £5500 p.a.

**A man or woman with two or more years' experience is required to work in the real-time operating systems area, or perhaps detailed level compiler work.**

**The important qualifications for this job are application and the ability to display a creative flair to software development work. Knowledge of operating systems or compilers would be advantageous, but evidence of creativity and mental capability is more important.**

RW 44/4

## SOFTWARE DESIGNERS - APPLICATIONS AND SYSTEMS SOFTWARE Up to £5500 p.a.

**Possibly graded as Senior Software Designers, these men/women will join a team with the responsibility to add new application packages and operating systems and language facilities to the company's established product range.**

**Candidates should have 2-4 years' experience, ideally gained in a process control environment, either as a member of a custom application group, or as part of a design group. Knowledge of at least two of the following must be evident:**

**Process Control**
**Communications**
**Real Time Operating Systems**
**Language Processors**
**Support Systems**

RW 44/5

**The above vacancies are all first-class opportunities to exercise your software skills to the full. You will be working with modern computers—Digital PDP/II range — and utilising them in a state-of-the-art, real-time process environment. The company's systems are in use throughout the world, controlling a wide variety of industrial processes, such as steelmaking and chemical plant, and the range of applications will undoubtedly be spread even further. The environment is thus interesting and stimulating and the work demanding and fulfilling.**

**The company places great store by its people, who constitute its principal asset. We would, therefore, be interested in hearing from individuals who have experience in the field and have a contribution to make, even though they need not exactly fit the above job descriptions.**

**You are invited to telephone Tony Baker 01-499 4501 to discuss these opportunities.**

**hutchinson-scoggins recruitment**
10 Dover Street London W1X 3PH Telephone 01-499 4501

JBA

# PROGRAMMERS
# Up to £6300

## NE London (Central Line/North Kent by Road)

An internationally known manufacturing company are expanding their management services department to cope with NEW AND CREATIVE DEVELOPMENT WORK. The company have an IBM370 which runs BATCH and Teleprocessing.

## All Programming is in PL/1 and ASSEMBLER

Programmers with experience in either language are invited to apply. The structure and philosophy of the company will ensure career progression to the highest levels and the opportunity to diversify experience. For example, there are strong possibilities that next year an on-line mini-computer system will be ordered for the production control group.

**For Further Information: Mike Creamer**
**JAMES BAKER ASSOCIATES**
**16 Maddox Street**
**London W.1.**
**Tel: 01-491 4478**

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# SYSTEMS ANALYSTS
# LONDON
## to £7500 p.a. + Mortgage
## + Bonus + Attractive benefits

**Major US Bank developing IBM and PDP based systems.**

Two really top quality Analysts are required by this leading Bank.

They will:

(i) Investigate a business area and determine a business systems definition
(ii) Undertake the detailed design of the system
(iii) Be involved in the development and implementation

Projects are aimed at timescales of 6 months to one year and the Analyst, actively participating in all phases of the development cycle, has considerable responsibility for successful implementation.

As a young, thorough professional (age circa 26), you will be demanding in your approach to work and career development. During the next five years you will have every opportunity to meet these demands. The London branch's computer department is undertaking a complete re-write of its banking systems and developing an International Overseas Network based on PDP kit.

The only really essential requirements are intelligence and sheer professionalism; if you have PDP or banking experience all the better.

RW 43/4

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# YOUNG SALESMAN
# CITY — c. £9000 p.a.
on quota

2 years' successful sales in business systems? — here is your next move.

A major international company has just launched a timesharing bureau activity — now is the time to join. The machines are installed and the software is implemented. A dynamic and pleasantly aggressive young salesman is required to bring in the business.

To do this you need to convince first time users on the benefits of computers for general commercial applications. No real technical knowledge is required, only a thorough understanding of business practice, the ability to sell to senior management, and plenty of industry.

In return for your effort, you will be given a high base salary and the opportunity to earn c £9000 p.a. on quota. As a new subsidiary of a large organisation, your career development is directly related to your personal qualities. A rare opportunity indeed.

RW 44/6

**hutchinson-scoggins recruitment**
10 Dover Street London W1X 3PH — Telephone 01-499 4501

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**N. LONDON — ICL SHIFT MANAGER — £6500**
4 years' George II experience with a knowledge of macro writing and maintenance is a requirement for this major retailing organisation. The chosen candidate will supervise the running of the machine room and be totally responsible for the staff on shift. If you feel that your experience is related to such a position, then apply now!

**CITY — IBM OPERATOR — £4000**
Our clients, an international banking organisation, require an operator for their IBM 370 installation. Only intelligent, self-motivated applicants with between 6 months and 2 years OS experience will be considered for this progressive company who demand a high level of technical expertise. In addition to an excellent salary, benefits include subsidised mortgage, annual bonus LVs, n/c pension, BUPA, / loans, mileage allowance, etc., etc.

**CITY — ICL SHIFT LEADER — £4000**
A minimum of 4 years' operating experience ideally George II with Macros involvement, is required for the leading financial organisation. A two shift system is in operation and it is envisaged that the successful applicant will transfer to New Range 2860 hardware in a supervisory capacity. Usual large company benefits apply including subsidised mortgage and LVs.

**SURREY — SUPERVISOR — £3800**
Our clients are seeking either an experienced Shift Leader or a current Supervisor to organise and run this small practical installation. Applicants must have prior experience of 2903 and George II operations. This is a DAYS ONLY position.

**OPERATIONS — VARIOUS**

| | | | | | |
|---|---|---|---|---|---|
| SEN OP | ICL 1900 | 12 mths. | Geo II | SURREY | £3600 |
| SEN OP / OPS | ICL 1900 | 12 mths | Geo II | W LON | £3600 |
| OP | ICL 1900 | 12 mths | Geo II | CITY | £3100+ |
| OP | ICL 1900 | 6 mths | Mon/GII | W LON. | £3100 |
| S LDR | IBM 370 | 4 yrs. | DOS VS | CITY | £4750 |
| TREM. OP | IBM 370 | 4 yrs | OS/DOS | CITY | £4500 |
| OP. Y 4 | IBM 370 | 12 mths + | OS | LON/MX | £4000 |
| OP. Y 2 | IBM 370 | 2 yrs. | DOS VS | S LON | £4000 |
| OP | IBM 370 | 12 mths | DOS VS | MIDDX | £3800 |
| SEN OPS | IBM 370 | 18 mths | OS | HERTS | £3750 |
| OP | IBM 370 | 18 mths | OS | CITY | £3700 |

**COMPUTER TWO THOUSAND**
**01-637 3265**
**217/218 TOTTENHAM CT. RD. W1P 9AF**

---

# Junior Commercial Programmer
## West Country

An opportunity within the Plessey Marine Research Unit, at Templecombe, Somerset.

We are looking for a suitably experienced man or woman to become involved in the development of systems covering a wide range of applications in the financial, administrative and management information areas. In-house and remote computing facilities are used.

Candidates should have at least 1 year's relevant experience. A knowledge of FILETAB/FTL6 and GEORGE III would be useful.

A competitive salary will be negotiated in line with experience and qualifications. Generous assistance will be given with relocation expenses, temporary lodging and travel.

Please telephone or write, giving brief career details, to Stuart Carter, Personnel Manager, Plessey Marine Research Unit, Wilkinthroop House, Templecombe, Somerset. Tel: Templecombe (0963 7) 551.

**PLESSEY**

---

# Young Philistine Analyst!
**S. Wales — c £5000 Plus Relocation Expenses**

Our Client is the world's leading producer of aluminium. Its U.K. manufacturing base has a turnover fast approaching £100M. p.a. and it is located in a most attractive rural area on the edge of the South Wales industrial belt. In line with their radical approach to management, they are engaged in a project which rationalises production using ICL 1902T with 80K core and an ICL 1901T with 48K core, with up to 42 visual terminals on the shop floor.

Your primary function will be to troubleshoot out in the front line once the system is fully operational. To train a workforce and top management in the way that DP can work for them, and to innovate giving the prescribed system progressive organic development.

Industrial experience linked with a degree level qualification may be the best background, but we're prepared to listen to you if you think you're the analyst for the job.

Ring Peter Humphreys, Swansea (0792) 43481, or write to P.E.R. 3rd Floor Grove House, Grove Place, Swansea, West Glam.

**PER** PROFESSIONAL and EXECUTIVE RECRUITMENT

---

# OPERATOR
## TWO SHIFTS : 1902T

Required for Oxford University Press's Computer Centre in North West London which has an ICL 1902T running under George I plus.

At least one year's experience of 1900 machines is required together with a good standard of general education.

Commencing salary around £3200 (including shift allowance), four weeks' holiday, cheap lunches and books.

Telephone J. M. Michelmore on 450-8080 or write to the Personnel Manager

**OXFORD UNIVERSITY PRESS**
Press Road, Neasden, London NW10 0DD

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# READY FOR TAKE-OFF?

In the career sense as well as in the travel sense. This is unique opportunity to:

- *see the world — Hong Kong, San Francisco, Paris, Sydney*
- *enjoy good basic earnings plus very generous expense allowances — £200 p.w. when away from home*
- *get 5 years' experience in 2 years — learn new languages and work with the latest hardware/software*
- *work in a stimulating, professional environment, with excellent prospects*

Our clients are a well-established, highly reputable international software house, currently working on major mainframe projects, both U.K. and Overseas. Expansion has created openings for

## PROGRAMMERS
## £3500/£6000

with upwards of one year's mainframe programming experience, including COBOL. You would be based in Richmond, Surrey (relocation assistance provided) and you should be happy to spend periods abroad as opportunities arise.

***Please ring us in confidence for an exchange of information, quoting ref: 482. Messages will be received after hours.***

Tel: 01-637 5796

**EDP Systems**
52-53 Margaret Street
London W1N 7FF

---

**SHIFT LEADER**
Three years experience with IBM 370/DOS/VS for a Surrey installation. Three shift system, three weeks' holidays.
Sal. £4300

**OPERATORS**
Eighteen months experience on any 3rd generation machine. Four shift system. West London installation.
Sal. Min. £3000

**SHIFT LEADER**
Two/three years experience with ICL 1900 GII. Two shift system for East London company.
Sal. to £4000

**OPERATOR**
One year + experience with NCR 75. Two shift systems for North London installation.
Sal. £3400+

**COMPANIES LOOKING FOR STAFF?**
Ring Avril Lively on 01-402 0933. She will take the details of any vacancies you may have.

**SENIOR OPERATOR**
Age 23+ to assist Ops. Manager ICL Sys. 10 experience for DAYS ONLY S.W.19 installation.
Sal. £3500

**RING NOW**

**OPERATOR**
Eighteen months + experience with IBM Sys. 3 MOD 15, DAYS ONLY. South London installation.
Sal. £3000

**OPERATOR**
18 months + experience with IBM 370/135. Two shift system running under DOS/VS POWER/VS GRASP. Middlesex installation.
Sal. £3400 + Bonus

**DAY OR EVENING**

**ASSISTANT OPERATIONS MANAGER**
Two years + experience with IBM Sys 3. DAYS ONLY. three weeks' holidays City installation.
£ Excellent

**STAFF LOOKING FOR COMPANIES?**
These are just a selection of vacancies we have available. Telephone Avril Lively for details of these and more.
01-402 0933

**OPERATOR**
Six months + experience with NCR Century. DAYS ONLY. W.C.1 installation. Early 20s preferable.
Sal. £2500+

**OPERATOR**
One year Manual or GII experience. Three Shift system in W.1. Early 20s, LVs, S/C, good promotion for the right person.
Sal. £3000+

**OPERATOR**
One year + ICL 1900 GII experience. Three shift system for Central London installation.
Sal. £3300

**OPERATIONS SUPERVISOR**
Three years' ICL 1900/2903 experience. DAYS ONLY for Surrey installation.
Sal. VERY GOOD

**AJK RECRUITMENT LIMITED (Emp. Agy.)**
**26 Chilworth Street, Paddington, London, W.2 — 01-402 0933**
ajk

Applied 1.54

# Programmers

## Career opportunities in future development

Up to £3500 Herts

Corporate Systems Programming provides an in-house computer service for all major areas of ICL. We now require Programmers to join our large programming department in Stevenage working on future development of Customer Engineering, Marketing and Finance Systems.

Our offices, which are situated in pleasant surroundings, are linked via RJE and VDU MOP Terminals to our 1904 equipment at Letchworth. We also operate a system of flexible working hours.

You will need up to 12 months' experience of COBOL preferably with George 3. A comprehensive training plan provides excellent opportunities for progress into all aspects of data processing.

Telephone or write to Alan Martin, Senior Personnel Officer, Corporate Systems, ICL, Cavendish Road, Stevenage, Herts. Tel: Stevenage (0438) 3361 Ext. 696. Please quote reference CW1569.

**International Computers**

think computers–think ICL

ICL

# HERTS AND NORTH LONDON

*We specialise in D.P. recruitment for clients in Herts and North London and the following vacancies are taken from our current register:*

**STANMORE**
Centred around an IBM 370/125 and 2 Ventek minis using on-line VDU's for Stock Recording, our client has a vacancy for a Systems Analyst to make up a team of three shortly to begin development of financial real-time VDU systems. Commercial IBM experience is a basic requirement — real time training will be given where necessary (up to £5750)

**TOTTENHAM**
Well-established international manufacturing organisation is seeking a Cobol programmer with 1½/3 years experience to join their IBM 370 complex in Tottenham. The installation is technically well advanced and the successful applicant will be involved in both on-line and batch support systems (up to £4500).

**WALTHAM CROSS**
A leading retail distribution group, known for its progressive attitude to D P development, offers dynamic career opportunities to all levels of Analysts (up to £6000), Analyst/Programmers and Programmers (up to £5000). Although the installation is based upon ICL 1904 hardware previous ICL experience is not a necessity as the company will arrange conversion training as required.

**BOREHAMWOOD**
Possibly the ideal installation — not too large, not too small. IBM based, informal, friendly, but very professional. The vacancy is for a Systems Analyst (c £5,000) to join a department of ten engaged in the development of both batch and real-time systems. Although applicants must have commercial systems experience neither IBM nor real-time knowledge is necessary.

**LUTON**
Small department of 2 Analysts and 3 Programmers has a vacancy for an Analyst/Programmer with PDP Basic experience to assist a Project Leader in the investigation, design and development of Order Entry/Invoicing systems in addition to being responsible for the supervision and guidance of the Programmers within the team (up to £4700)

**ENFIELD**
The Management Services Group of a highly respected ICL user has vacancies for Systems Analysts (up to £6000), Senior Programmers (up to £5500) and Programmers (up to £4600) to assist in the development of a range of T.P. and batch applications. Hardware will shortly include an ICL 2970, planning for which is well under way.

For more information on these and many other vacancies ring

**HAYMARKET COMPUTING LIMITED. Tel. CUFFLEY (HERTS) 4130**
(UP TO 7.00 p.m.)

# Analyst/Programmers

City — £5,500-£6,000 + benefits

**International Banking**

Our Client, a well-respected and rapidly expanding International Merchant Bank, has recently employed a leading software firm to instal a mini-computer based real-time banking system.

Two Analyst/Programmers are now required to assist in the implementation and development of the project. Candidates should have a minimum of 2 years' programming experience, preferably on real-time applications, together with considerable exposure to banking operations; a knowledge of BASIC would be an advantage.

Personal qualities of self-motivation and initiative are essential, and the successful applicants will be rewarded with excellent opportunities for career development in addition to competitive salaries and attractive fringe benefits including subsidised mortgage.

**Contact Tony Tucker in confidence on 01-248 3812.**

**NPA Recruitment Services Ltd**
60 Cheapside London EC2 Telephone 01 248 3812345

**FREELANCE PROGRAMMERS**
ICL 1900/SYSTEM 4
HONEYWELL
FOR INTERESTING PROJECTS
IN THE NORTH WEST
CONTACT: GERALD PLIMBLEY
ON 061-969 4615

**COBOL CONTRACTS IBM OR ICL**
UK & EUROPE
RING PENNY
01-402 9355

**BRIGHTON POLYTECHNIC**
**COMPUTER CENTRE**

The Computer Centre supports services for teaching research and administration for the Polytechnic and for a number of local colleges and schools. The service is based on ICL 1904A/Digico Micro 16V and HP 2000 computers which provide local and remote batch and multi-access facilities.

The following vacancies arise from a major staffing review

1 **MANAGER: USER SERVICES**
**£5523-£6909**
To head an expanding section with responsibility for providing user oriented applications software and information services.

2 **APPLICATIONS PROGRAMMER — 3 POSTS**
**£2439-£3165 or £3234-£4407**
plus up to £4 a week salary supplement
To assist in the work of the User Services Section.

3 **SYSTEMS PROGRAMMER**
**£2439-£3165 or £3234-£4407**
plus up to £4 a week salary supplement
To assist in the development of systems software for the above system.

4 **TECHNICIAN**
**£3234-£4014**
plus 6% salary supplement and 10% payment for irregular hours
To develop and maintain the data communications network and associated equipment.

For further details and application forms, write to the Personnel Officer, Brighton Polytechnic, Moulsecoomb, Brighton BN2 4GJ, tel. 0273 693655 Ext. 2537. Informal enquiries to: Tony Warburton or Brian Bailey, Ext. 2157 or 2166. Closing date 18th November, 1977.

# COMPUTER PROGRAMMER & TRAINEE PROGRAMMER

Based in London, Programmer with 2 yrs. exp. in Cobol and Plann. on ICL systems. Also University Graduate or similar looking for a career in Computer Programming.

For these and other vacancies, contact:

Gary Turner
S. & W. SERVICES
26a High Street, Hounslow, Middlesex
Tel: 01-572 7363
*Recruitment Company*

# Opportunities in Green Belt Hertfordshire

Merck Sharp & Dohme is a world leader in the production of ethical pharmaceuticals. The company's development programme, which will include the setting up of a database and the introduction of tele processing systems early in 1978, creates the following opportunities at its U.K. headquarters in Hoddesdon, Hertfordshire.

**Systems Analyst** Salary Negotiable

You should have 2-4 years' experience of systems analysis, preferably gained on I.B.M. installations.

**System 3 Programmer** c. £4,500

You will join our team working on a model 15B computer with disk and tape. You will be expected to have a sound R.P.G. background on IBM System 3 equipment; experience of C.C.P. and 3270 systems.

Conditions of work are first-class and an excellent benefit package will include four weeks' holiday, free life assurance and contributory pension schemes.

Please write to or telephone for further information to the Personnel Manager.

MSD
MERCK SHARP DOHME
Merck Sharp & Dohme Limited,
Hertford Road, Hoddesdon, Herts. EN11 9BU.
Telephone: Hoddesdon 67272

**Hawker Siddeley Dynamics Ltd.,**
**Lostock, Bolton**
**BL6 4BR Lancashire**

# Computer Specialists

We are developing our well-established Data Processing Department to further extend the highly sophisticated systems which we operate and which range through Manufacturing, Purchasing and Financial areas.

This leads to the following positions being available: —

**CHIEF PROGRAMMER**
**SENIOR PROGRAMMERS**
**TRAINEE PROGRAMMERS**
**SYSTEMS ANALYSTS**

**The computer configuration consists of a 512K IBM370/138 with 3270 VDUs on real time systems, 3790 key to Disc and 2790 data collection on line to a system 7.**

**Software used includes DOS/VS, CICS/VS, POWER/VS, D/BOMP, DL/1 VTAM and SPMOL.**

**Programming languages used are Assembler, PL/1, RPG11 and MSP7.**

**People of either sex who are interested are invited to get in touch with E.G. Williams, Personnel Manager, at the above address.**

**HAWKER SIDDELEY DYNAMICS LIMITED**

HAWKER SIDDELEY **dynamics**

a *BRITISH AEROSPACE* company

# Sail to the East Midlands

| | | |
|---|---|---|
| Real Time PROGRAMMERS<br>Assembler/Coral | Leicestershire | up to £4,800 |
| SYSTEMS ANALYSTS<br>Accounting & Stock Control | Loughborough | £5,000 |
| ANALYSTS & PROGRAMMERS<br>Experience in low level language on mini VRC | Leicester | £4,500 |
| PROGRAMMERS | Leicester | £4,000 |
| ANALYSTS & PROGRAMMERS<br>Experience PL1/BAL | Lincolnshire | up to £4,850 |
| PROGRAMMING SUPERVISOR | Lincolnshire | £6,000 & car |
| ANALYSTS & PROGRAMMERS<br>on-line systems | Peterborough | up to £4,850 |
| SYSTEMS ANALYSTS<br>financial systems | Coventry | £6,000 |
| PROGRAMMERS | Coventry | £4,000 |
| ANALYST/PROGRAMMERS | Nottingham | £4,800 |
| PROGRAMMERS<br>BAL or Cobol/PL1 | Derby | £4,500 |
| PROGRAMMERS<br>Cobol/BAL | Nottingham | £4,000 |
| SYSTEMS ANALYST<br>financial & production control | Derby | £6,000 |
| PROGRAMMERS<br>Scientific Algol/Fortran | Leicester | £4,000 |
| COMPUTER SALES | Nottingham/Leeds | £7,000 |
| ANALYSTS/PROGRAMMERS | Leicester | up to £5,000 |

Over 60 other vacancies are available on our register. To find out more please write or phone

*Ludbrook Management Services*
Recruitment Consultants.
1 Gallowtree Gate, Leicester. Telephone Leicester 29728

# ventek...

## not just another computer company
## needs more Computer Professionals

SYSTEMS
PRE-SALES SUPPORT ANALYSTS (Lichfield and Head Office, Wembley)
PROJECT LEADERS
PROGRAMMERS
ANALYST/PROGRAMMERS
SOFTWARE PROGRAMMERS
SALES
SALES EXECUTIVE

# TAKE A GREAT STEP FORWARD AND JOIN US

**JOIN VENTEK**
Ventek has opportunities in all divisions at all levels for: — Systems — Programming — Sales Personnel — preferably with experience in mainframe, mini computer, or intelligent terminals systems.

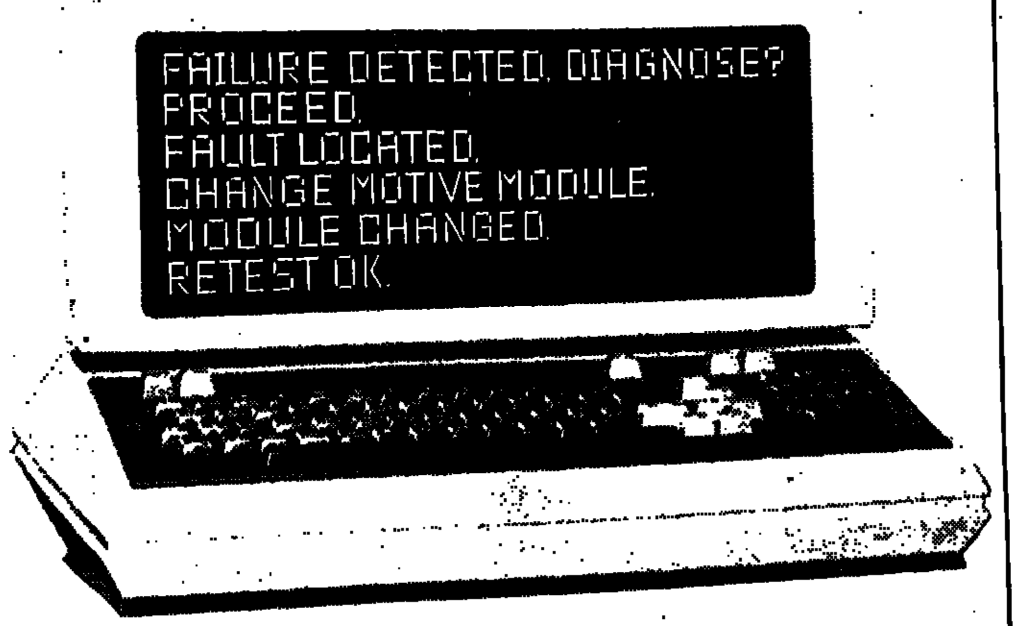
**ABOUT VENTEK**
Ventek continues to maintain its leadership in the rapidly expanding Distributed Data Processing market in the United Kingdom.
Sales of the outstandingly successful DATAPOINT range of computer systems continue to surge forward (over 1,400 systems installed) and, as a result, Ventek urgently requires more first rate computer professionals to join their young and enthusiastic team.

**MEET VENTEK**
Ventek offers a challenging and rewarding career with good rewards for ability and performance. We encourage the development of staff and we welcome new ideas. Ventek offers exceptional opportunities for career advancement in a rapidly expanding but established company.

Why not come and meet us at: —
THE BLOOMSBURY CENTRE HOTEL CORAM STREET LONDON W.C.1
(NR. RUSSELL SQUARE TUBE STATION)
ON TUESDAY, WEDNESDAY 8TH AND 9TH NOVEMBER
BETWEEN 11.00 A.M. and 7.00 P.M.

PLEASE CALL CAROLE PORTER ON 01 903 6261 to make an appointment for us to meet at The Bloomsbury Centre, or if you cannot make it on the 8th or 9th November, please write, giving brief details of your career to date to: —
A.D. WATSON, Ventek Limited
17th Floor, Station House, Harrow Road
Wembley, Middlesex HA9 6ER.

**ventek**
The Leaders in Distributed Data Processing
*A TRW AFFILIATE COMPANY*




# Diagnostics

Project Ptarmigan is a mobile, flexible, digital communications system for the British Armed Forces.

We require hardware and software personnel with an interest in diagnostics to develop and implement both diagnostic and executive software to achieve self diagnosis by the system.

Specific diagnostic experience is not essential but previous hardware and/or software experience is expected.

The Ptarmigan Switch Unit is one of the high technology businesses of the Poole site, which employs in total some 2,000 people, and provides a continuing opportunity for career advancement and development.

Plessey Poole is located in a particularly pleasant part of the South Coast. An attractive salary package is offered which includes immediate entry into the Company's pension/life assurance scheme. Where appropriate, generous relocation expenses will be paid.

Take advantage of this opportunity and contact George Wagstaff now on Poole (0201 3) 5161, reversing the charges, or write to him at The Plessey Company Limited, Sopers Lane, Poole, Dorset BH17 7ER, quoting ref. PV12.

**PLESSEY**

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**National Coal Board**
**Mining Research and Development Establishment**

The Mining Research and Development Establishment is the National Coal Board's centre for research, development and testing in all fields of engineering and science related to coal mining. Computer monitoring and control is an important theme of the work of the Establishment. There are a number of vacancies for

# COMPUTER SCIENTISTS

The successful applicants will work in small multi-disciplinary teams exploring the further experimental application of 'MINOS' – the standard colliery process control minicomputer system developed at MRDE.

Applications of 'MINOS' include
- Mineral handling and control
- Mine ventilation monitoring
- Fixed plant and electrical distribution monitoring
- Coal preparation control
- Production control
- Information processing for mine management

Scientists are also needed to support proven applications and to investigate the technology leading to the next generation of mining systems, and there are vacancies for Engineers or Programmers with training or experience in the application of minicomputers to real time monitoring and control.

One post requires specialist knowledge of microprocessors with considerable experience of microprocessor programming.

Candidates should have a degree in computer science or an engineering subject and should be capable of programming at assembler level. A knowledge of PDP 11 systems, RSX 11M and CORAL would be an advantage. For the more senior positions, evidence of contribution to proven applications will be sought.

The starting salary for these posts will be according to qualifications and experience in the range £3,300 to £5,500. Excellent benefits include nearly six weeks annual holiday.

**Please apply to the Staff and Administration Manager quoting reference no. 705.**
**National Coal Board,**
**Mining Research and Development Establishment,**
**Ashby Road, Stanhope Bretby, Burton on Trent, DE15 0QD.**

NCB MINING RESEARCH AND DEVELOPMENT ESTABLISHMENT

---

# Senior Computer Operators for new Data Centre

Up to £4400 — Herts

To cope with planned expansion we now require Senior Computer Operators at our recently established Data Centre at Stevenage. It currently operates with 2 large 1904S configurations running with George 3 and provides an on-line and batch service to ICL Locations throughout the UK.

You will work within a 3 shift rota system and you will require at least 12 months' experience of 1900 hardware under George 3. Experience of a communications orientated environment will be a distinct advantage.

Please write or telephone Alan Martin, Senior Personnel Officer, Corporate Systems, ICL, Cavendish Road, Stevenage, Herts. Tel: Stevenage (0438) 3361 Ext 696. Please quote reference CW1568.

**International Computers** — ICL
think computers—think ICL

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# Chief Programmer

## Make the most of your experience

DRI is one of the leaders in the design and manufacture of computer peripherals ranging from tape and disc based memory devices to terminal equipment. We are currently expanding our business and developing many new products to add to our existing range.

We need a Chief Programmer to work within our Data Processing Department, which is centred around an ICL2904, reporting directly to the D.P. Manager. Supervising a team of four programmers you will be involved with writing and up-dating new and existing programmes covering stock accounting and inventory control packages.

You should have at least six years programming experience using COBOL RPG II and TABN as well as on-line knowledge. Previous experience of supervising programmers and operators would also be expected.

A competitive salary, reflecting the importance of the position will be paid as well as an excellent range of fringe benefits. Due to the continued expansion of the company, opportunities for advancement within the DP function are very real.

For further details please write to or telephone Ronald Brown, Personnel Manager, Data Recording Instrument Co. Ltd., Hawthorne Road, Staines, Middx. TW18 3BJ. Telephone: Staines 51388.

(DRI) Data Recording Instrument Company Limited

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**CAPITAL APPTS.**
34, Percy St. London, W.1.
**FORTRAN**
**Experienced and Graduate Trainee Programmers**
urgently required for industrial and scientific development
£7,000
ALL AREAS
Phone for free list of vacancies
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**PROGRAMMERS**
WEST COUNTRY
1900 COBOL
c £4000
Phone 01-439 6481
(24 hours)
EFFECTIA GRAVIS
Personnel Consultants

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# DPS PROGRAMMER/ ANALYST

Applications are invited from suitably qualified and/or experienced DPS Programmers and DPS Analysts for vacancies at the Dungeness "B" Nuclear Power Station at Romney Marsh, Kent.

The system comprises 3 x Ferranti Argus 500 computers with principal function of on-line data acquisition and direct digital control of nuclear reactors and turbine sets.

The successful applicants will be involved in the modification and testing of existing programs and the incorporation of new programs into the system together with the preparation of test specifications.

Ideally the successful applicants would be qualified to at least HNC standard in computer science, mathematics or an engineering discipline but candidates able to offer a proven record of extensive and appropriate experience would be considered. In all cases a minimum of one year's experience of assembler programming would be necessary.

The Company offers competitive salaries, a contributory pension scheme including life assurance, and assistance with house removal in appropriate cases.

Persons interested, male or female, should write or telephone to the address below for an application form.

**The Personnel Office**
**Atomic Power Constructions Limited**
**Vigilant House**
**8/14 Sutton Court Road, Sutton, Surrey**
**Telephone: 01-643 3333**

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# COMPUTER OPERATOR

Boosey & Hawkes leading musical instrument manufacturers and distributors require a Computer Operator for their new ICL 2904 installation. A variety of interesting applications including on-line systems are being implemented which will necessitate shift work in the future.

If you have had at least 6 months' operating experience and are seeking a new challenge, then we would like to hear from you.

A competitive salary will be offered and benefits include pension scheme and subsidised canteen.

Please write or telephone:
Mr. L. Blood, Personnel Manager,
Boosey & Hawkes Musical Instruments Limited,
Deansbrook Road, Edgware, Middlesex.
Tel: 952 7711

BOOSEY & HAWKES





# MYRIAD APPOINTMENTS LIMITED

Computer Personnel Consultants

## COBOL PROGRAMMERS

**NEW MACHINE**

**Near KING'S CROSS — £3800-£5500**

Excellent opportunities have arisen for Programmers and Senior Programmers seeking a position in a progressive environment. The current ICL processor, which is used for on-line and batch systems, is to be replaced by advanced hardware next year.
Successful candidates will be involved with a variety of applications and will be able to gain familiarity with the use of sophisticated software. Those appointed will work in project teams and will be encouraged to gain career development within the organisation.
Applicants should be able to offer 1-4 years' COBOL experience, as appointments as PROGRAMMER or SENIOR PROGRAMMER will be made on a salary level appropriate to individual experience.

## COMMUNICATIONS PROGRAMMER

**Near PUTNEY — £ EXCELLENT**

A Senior Programmer with a sound knowledge of T.P. systems is required to specialise in all communications software issues within our client's new 2900 installation.
The person appointed will develop the T.P. interface software to run the 2900 communications system and provide technical support for all teleprocessing systems. He/she will also be required to liaise with both users and ICL to establish a regular interchange of technical information.
The Company has a country-wide communications network operating a number of on-line and real-time applications. The current 1900 configuration is scheduled to be upgraded by dual 2960's early next year and a distributive processing network is under consideration.
This is an ideal opportunity to pursue a technical career within a progressive environment using the latest techniques and equipment. All necessary training will be given.

## MINICOMPUTER PROGRAMMERS

**(SOFTWARE OR COMMERCIAL)**

**BUCKS/HERTS — £4000-£6500**

Forward plans have created positions for Programmers and Senior Programmers with sound knowledge of an ASSEMBLY language.
Applicants should have a minimum of two years' assembly level programming. Those with in-depth experience will be appointed at a senior level.
Candidates will be consisered for vacancies within the software or commercial divisions of the company. SOFTWARE PROGRAMMERS should be able to offer previous experience in the area of software development, possibly encompassing familiarity with more than one operating system. APPLICATIONS PROGRAMMERS will require previous commercial experience, preferably supported by knowledge of a high level language.
Those appointed will work on controlled projects within a professional environment.

## PROGRAMMERS TO PROJECT LEADERS

**S.E. LONDON — £3800-£6500**

Following a period of expansion in their data processing department our client has several openings for experienced computer personnel.
There are vacances at most levels, ranging from quite junior Programmers through to Analyst/Programmers and Senior Analysts with potential to move into project leading positions. All positions provide excellent oppportunities for career progression in a growing and technically advancing department.
Candidates should be able to offer from around twelve months' COBOL programming experience gained on one of the leading manufacturers mainframes.
Salaries will be commensurate with experience but as a guideline are likely to fall in the above stated range. In addition the company provide a comprehensive package of benefits.

Please telephone for a confidential discussion or write to:
30 Fleet Street London EC4Y 1AA
01-353 5868

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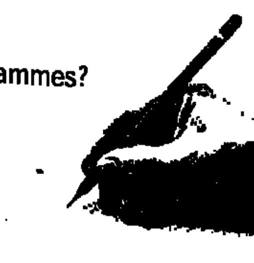
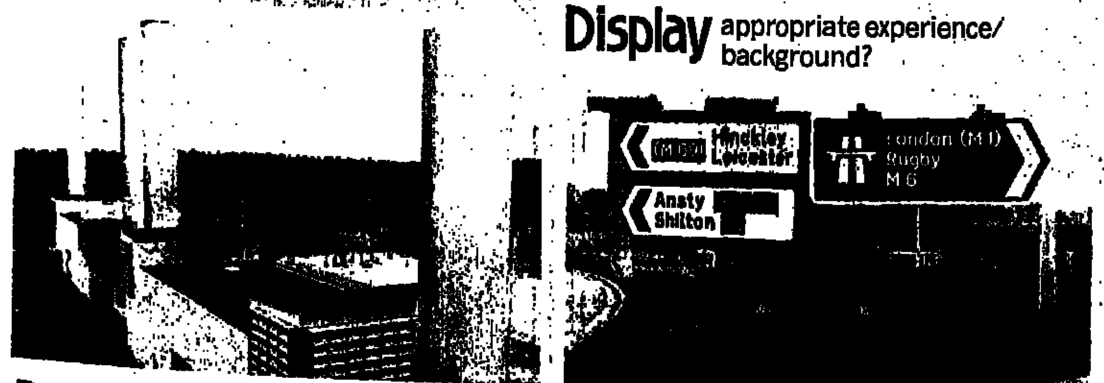
# How many of these COBOL verbs apply to you?



**Write** COBOL programmes?



**Display** appropriate experience/ background?

**Accept** the challenge of big new projects?

**Add** all the advantages of a Rolls-Royce career—and

**Perform** the simple operation of phoning or writing to:
Mrs. K. Brown, Personnel Department,
Rolls-Royce Limited,
Industrial & Marine Division,
P.O. Box 72, Ansty, Coventry CV7 9JR.
Tel: Coventry (STD 0203) 613211 Ext 60

**Move** to join a dynamic team in ideal surroundings?

Rolls-Royce Limited, Industrial and Marine Division

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# UK AND OVERSEAS COMPUTING ASSIGNMENTS

**HONG KONG US$30,000 DATABASE PRACTITIONERS**
Vacancies exist for **DESIGNERS** and **CONSULTANTS** with an in-depth knowledge of **CODASYL** Data-Base software in any main frame environment. Successful candidates will be offered a full relocation package and in addition, will be housed in fully air-conditioned accommodation.
Interviews will take place in London in late November and early December.
Ref. MS 11/01

**VANCOUVER/NEW YORK and E.E.C. COUNTRIES**
**PROGRAMMERS/DESIGNERS** with a minimum of three years experience on **PDP 11** hardware, preferably under **RSX 11M.**
Message switching, communications and networking experience is essential for these positions. For the European positions French or German language ability is an added advantage.
Interviews will be held in our offices.
Ref. MS 11/02

**PROCESS and NUMERICAL CONTROL PROGRAMMERS**
**LONDON and HOME COUNTIES**
On behalf of several Users and System Houses we have outstanding requirements for Programmers and Designers offering a minimum of one year's software experience on any mini computer or micro-processor. Vacancies exist in Inner and Greater London, Hertfordshire, Surrey. Salaries are negotiable between £4,250 and £7,500.
Ref. MS 11/03

**AIR LINE TICKET RESERVATIONS and CARGO HANDLING SPECIALISTS — EUROPE**
Our client is seeking for its permanent staff **SENIOR PROGRAMMERS, SYSTEMS DESIGNERS/CONSULTANTS** in an **ENGLISH SPEAKING** environment.
Candidates must have relevant air-line ticket reservation and cargo handling experience on **UNIVAC** and/or **IBM** mainframes. On completion of the project there will be an opportunity to relocate to Scandinavia or Middle East.
Ref. MS 11/04

Interviews will be held in our offices in mid and late November.
PLEASE PHONE OR SEND CVs QUOTING REF. NO. TO JOHN STALEY.

**Malla Software Limited**
Tel: 01-387-1603 334 Euston Road, London NW1 3BD

# MYRIAD OPERATIONS
Computer Personnel Consultants

## OPERATOR

**2 SHIFTS** **£ NEGOTIABLE**

Our client is a successful marketing organisation with outlets throughout the U.K. and Europe. An additional operator is required to assist with the running of their NORTH LONDON data-centre.

Applicants will probably have a year or eighteen months experience, preferably in a small multi-programming installation, and be available to work on a two shift system rotating on a three weekly cycle (i.e. two weeks 9 a.m. - 5.30 p.m. followed by one week 4.30 p.m. - 12 midnight). This installation is able to offer an enthusiastic person the opportunity to accept additional responsibility since the successful candidate will, after an initial induction period, be required to run a shift.

In addition to the commencing salary, shift and travel allowances will combine with a range of fringe benefits to produce an attractive remuneration package.

Please telephone for a confidential discussion or write:
30 Fleet Street London EC4Y 1AA
01-353 5868

# SYSTEMS ANALYST
c. £7,000
CENTRAL LONDON

Our client, the British office of a major U.S. organisation, using equipment, now wish to appoint a Systems Analyst for their professional computer department.

As a skilled member of the computer team, you will be responsible for Systems and Programming Manager for the analysis, design, implementation of various new applications including on-line systems. You will be a measurable entity in your own right and you will receive training to enable you to progress along a well defined career path.

Competitive company benefits include, amongst others, free lunches, non-contributory pension scheme and season ticket loan.

**For further details, please telephone LINDA BENSTED on 01-836 6775**

**COMPUTER PERSONNEL INTERNATIONAL**
110 St. MARTINS LANE,
LONDON WC2N 4BH
Computing Services Association

# KENT — Starting Salaries to £6,000

★ IBM 370, DATABASE, TP
★ Excellent Working Conditions and Benefits
★ Attractive Rural Location
★ Good Career Prospects

With all this to offer, why do we need to advertise? Well, one of the advantages of the company is that as a computer services organisation to a major international group, attractive internal promotions often arise — hence these openings.

Development staff are grouped into mixed teams of Analysts and Programmers — each responsible for new and existing systems on a continuous basis for the various group companies. The applications are mainly financial and accounting and, whilst much of the new development will involve Database, the work will be a mixture of new development, trouble-shooting, enhancements and maintenance. The equipment is an IBM 370/158, OS/VS1, SHADOW TP Monitor, with communication links to various U.K. and overseas sites. An IBM 3031 is on order.

***Senior Programmers / Programmer/Analysts*** — ***Starting £5,000-£6,000***

Applicants will require a minimum of 3 years' programming experience, with at least one year's OS COBOL. They will design, write and implement programs and on occasions supervise small teams of programmers.

***Programmers*** — ***Starting £3,850-£4,500***

A minimum of one year's COBOL on any hardware is acceptable. Full training will be given in IBM COBOL, JCL, etc.

***Technical Programmer/Analyst (strong OR background essential)*** — ***Starting £5,500-£6,000 (appreciably more for in-depth experience)***

Applicants will be graduates, preferably in a numerate discipline, with at least two or three years' practical experience using FORTRAN, able to work on their own, and capable of designing and developing models. Experience of Distribution and Inventory Modelling particularly related to the petrochemical industry would be considered advantageous. The position also requires the ability to communicate effectively with senior levels of management.

Besides the IBM equipment the company also have a DEC PDP 8 installed. Applicants with programming experience on this hardware should also apply.

The working conditions are excellent; superb offices in the country, subsidised canteen, relaxed friendly atmosphere combined with high computing standards using the latest techniques. Benefits include Flexitime, sports and social facilities, free life assurance and a very attractive pension scheme. Reasonably priced housing is available within easy reach. THE COMPANY HAS A VERY GENEROUS RELOCATION PACKAGE.

For further details, please contact CROYDON office giving the following reference: CW61-7T, or leave your telephone number and we will telephone you during the evening with more details.

01-686 9693 (24 HOUR ANSAPHONE) 19, PARK STREET, CROYDON, CR9 1TN | 061 236 2419 FAULKNER HOUSE, FAULKNER STREET, MANCHESTER, M1 4YD

COMPUTER AND PROFESSIONAL PERSONNEL CONSULTANTS — **CAPP ASSOCIATES** LONDON AND MANCHESTER — Computing Services Association

# Senior Programmers

**Hertfordshire c£5,000 p.a.**

Our client is an internationally known engineering organisation based in the Hertfordshire area, in pleasant rural surroundings. One of their key departments which provides a development tool for Engineers is seeking programmers, aged 30-40 years, preferably with a degree/HNC in computer science although relevant experience is more important for the following poistions.

1. To lead a small team of mainframe programmers, design software suites, and co-ordinate their technical design. Candidates should have at least five years' main frame experience, preferably on IBM 370 OSVS operating system.
2. To lead a small team of mini-computer programmers, design systems software and co-ordinate the technical design of the programmes produced by the team. Candidates should have at least five years' experience in mini-computers, preferably at assembler level.
3. To be responsible to the Group Leader for New Projects software, in particular compiling and editing systems. Candidates should have at least five years' total programming experience on IBM 370 in COBOL and on mini computers in ASSEMBLER, preferably with compiler writing and management experience.

Conditions of employment are those which would normally apply to a major engineering concern and relocation assistance is available where appropriate.

Contact Lynda Bubb, PER, 66 Park Street, Luton 0582-417882

PER PROFESSIONAL and EXECUTIVE RECRUITMENT

This vacancy is open to male or female candidates.

# Brand New Chevy Vega

**$2686**

**That's roughly £1,550**

Your salary could be 13,500-20,000 dollars p.a. £7,750-£11,494 p.a. when we went to press. That Chevy shows just how far that kind of salary can go.

That kind of salary could be yours. We have contracts in Detroit, Chicago and Minneapolis for 6-12 months with leading US companies.

We want Systems Analysts and Programmers with at least 4 years' experience. You must have IBM know how.

Travel to and from the US is free. Accommodation will be arranged. People without family ties are preferred.

Your first step to the golden West is to lift the phone, dial **021-643 4577** and talk to Steve Clatworthy or Dave Wallis.

Project Recruitment, Temple House, New Street, Birmingham.
An associate company of Gould Computer Systems Ltd.

# EXCEPTIONAL ENGINEERS WANTED

*"The exceptional progress made by our company in the past 16 years is as much to the quality of our people as to our systems and products. Our continued growth depends on our ability to recruit more people of exceptional calibre."*

***David Broster, General Manager, Johnson Control Systems***

The world leaders in total building automation, Johnson Control Systems, have vacancies for additional Systems Engineers to work in the field, based in the Engineering Services Department at Esher, Surrey.

You must be qualified in electronic or computer engineering to at least ... level and have several years' experience in the commissioning ... maintenance of computer or electronic systems.

The job we offer involves giving practical support to our commissioning ... servicing personnel in getting computerised control centres into operation ... will also visit installations throughout the country to rectify faults and carry out maintenance reviews.

Your rewards will include a competitive salary and fringe benefits, ... encouragement through participation in formal training schemes and ... opportunity to work on top projects with colleagues who are both capable ... friendly.

If you'd like to join Johnson Controls please telephone or write for Application Form to:

JOHNSON CONTROLS

**Bryan Amey, Engineering Services Manager, Johnson Control Systems Ltd., Hillbrow House, Hillbrow Road, Esher, Surrey KT10 9UD
Telephone: Esher (78) 67471**

# data analyst

We are a large, long-established printing company internationally famous for quality colour printing. We also have strong publishing and retail interests.

We are expanding our computer operations to provide improved management information and control initially in areas of production planning, estimating and cost control. Applicants should have experience of programming and systems analysis and be capable of working closely with production and line management, recognising the appropriate basic data, rationalising and interpreting for computer application.

This is a new appointment which carries an attractive salary and assistance with removal expenses.

Please telephone to discuss, or write with full details to: Mr G. Rowe, Personnel Manager, Jarrold Printing, Whitefriars, Norwich NR3 1SH.
Tel: 60211.

JARROLD printing

# Telford
Your Opportunity

**TELFORD DEVELOPMENT CORPORATION**

## COMPUTER STAFF

The Corporation is developing the New Town of Telford in Shropshire to a population of 150,000, involving major capital investment together with management responsibilities. The Finance Department has current vacancies for:

(a) Senior Programmer — New Towns Grade VII (£4,395 to £4,845 plus £520 supplement).
(b) Programmer — New Towns Grade V (£3,366 to £3,708 plus £513 supplement).

The Corporation has a new Honeywell 62/40 with discs to carry out its highly diversified computing workload, using RJE and multiple batch, and moving towards communications using V.D.U. equipment. A heavy schedule of development of new and amended systems is underway. Two COBOL programmers are required, ideally experienced in a multi-programming environment using JCL and advanced data management techniques.

The Corporation offers housing to rent, generous relocation expenses, loans for car purchase and mileage allowances, superannuation and life assurance scheme. Applications should be sent to the Corporation Secretary, Telford Development Corporation, Priorslee Hall, Telford, Salop, within 14 days of the date of this advertisement.

**THE UNIVERSITY OF SUSSEX**

**COMPUTING CENTRE**

## APPLICATIONS ADVISORY PROGRAMMER

(Male / Female)

The advisory service provided by the Centre for the University has a vacancy for a graduate programmer to work in a small team assisting postgraduate and staff members of the University to use services provided by a locally sited ICL 1904S computer and remote CDC 7600 systems accessed by batch data links. Experience in using ICL or CDC packages or FORTRAN, or in producing introductory documents on programming, is desirable. Ability to communicate advice to users with widely differing levels of experience in computing is essential. This faculty appointment is likely to be made towards the upper end of the salary range £3,333-£5,627 per annum with four weeks' annual holiday plus bank holidays and normal University closures of two weeks per annum.

Applications including two referees to the Staff Records and Recruitment Officer, Sussex House, University of Sussex, Falmer, Brighton, Sussex. BN1 9RH, to arrive not later than 21st November, 1977.

# LAWSON OF DYCE LIMITED
## ABERDEEN
## PROGRAMMER

Applications are invited from suitably qualified persons for the above vacancy which has arisen in our Computer Department.

The applicants must be experienced in COBOL.

We operate an I.C.L. 1901T 44K with 4 E.D.S. 60 ... Magnetic Tapes.

The salary and other benefits available are in keeping with those of a progressive multinational company of which we are ...

Applications in detail indicating salary required should be addressed to: —

The Company Personnel Manager
Lawson of Dyce Limited
Dyce
Aberdeen
AB2 0HR

# Valentines of Dundee

To further the development and implementation of computer systems within the company, we require a

## BUSINESS SYSTEMS ANALYST

The ideal candidate will be a qualified systems analyst, possibly over 25 years of age, with experience in initiating and progressing computer systems. Specifically in production areas of a manufacturing company, and with the personality and ability to liaise with top management, both in the production and computer functions.

It would be advantageous if the person appointed has knowledge in management information, sales order processing and financial systems.

We offer excellent conditions of employment which include a realistic starting salary, 35-hour week, 4 weeks' annual holiday, plus statutory holidays, contributory pension/free life assurance scheme, canteen facilities, etc.

**If you believe you are the person we are looking for and keen to benefit within a progressive and expanding company, please let us hear from you, either by telephoning Dundee 814711 for an application form or alternatively writing to:**

**Personnel Manager,
Valentines of Dundee, Limited,
P.O. Box 74, Kingsway West,
Dundee, DD1 9NQ.**

**KINGSTON POLYTECHNIC
Division of Educational Studies**

## TECHNICIAN

required with some experience in the operation and control of computer equipment, and some knowledge of mathematics. A familiarity with computing desirable as the technician will operate terminals, design programmes and use a variety of equipment under the direction of the course tutor. T2 grade £2629-£2863 + £312 supplement + stage 2 + £285 London allowance.

Application forms from Assistant Registrar (personnel), Kingston Polytechnic, Penrhyn Road, Kingston upon Thames KT1 2EE. 01-549 1366.

# McMichael Limited
are
## Expanding

A major new project involves the development of a computer controlled real time analysis system.

We require a

## Senior Programmer

experienced in RSX 11-M to head a team engaged in the development of this system.

The Department is also considering setting up a computer services group to serve all development projects. The successful applicant will be well placed to play a leading role in the formation of this group.

Please telephone us on Slough 24541 or write to:-

Mr. C. Clare
McMICHAEL LIMITED
Wexham Road
Slough, Berks.
SL2 5EL
(A G.E.C. Electronics Company)

## GOLDEN OPPORTUNITIES

| | | |
|---|---|---|
| **SNR. ANALYST** Hampshire | Exp. of stock control and user contact. | £c.5.2k |
| **COBOL PROGRAMMERS** Worcester | 2 year + experience | to £5k |
| **SNR. ANALYST** Worcester | 2 years + systems experience, prog. background | to £5.7k |
| **RPG 11 PROGRAMMERS** West Midlands | Graduate 2 years + exp., job satisfaction and interest | to £4.5K |

Need we say more — these are just a few of the many choice positions we have available — why not phone us today on 0272 45085. We may have an opportunity just made for you.

job executive (Bristol)

# New Sales Support & Sales Opportunities — UK

A major international computer manufacturer is announcing in Europe an exciting proven range of small computers in the New Year. They therefore immediately require Branch Managers, Systems Analysts, Salesmen and Technical Support Personnel as well as a UK Training Officer. Previous experience should be with RPGII typre computers or mini computers using commercial skills with a professional approach to problem solving. Personnel will have a marvellous opportunity to get in on the ground floor where salaries will be very competitive. Vacancies exist in W. LONDON, BIRMINGHAM, MANCHESTER and LEEDS CW 44/9, Michael.

## Senior Operator Herts. £5,000 incl.

A major ICL user requires really good GII operators with supervisory experience. Relocation expenses are offered and there is paid overtime. CW 44/10, Patricia.

## Operators Slough £3,700 to £4,700 incl.

A large DOS installation with normal 3 shift working requires experienced personnel. Excellent sick pay scheme and Xmas bonus. CW 44/11, Patricia.

## Senior Operator Nr. Hounslow £3,800 incl.

Have you large ICL GII experience? Good; then this firm is anxious to meet you. Nice people and good promotional chances. CW 44/12, Patricia.

## Programmers to Systems Analysts Birmingham £3,500 to £5,000

We now have eight famous commercial manufacturing companies in BIRMINGHAM looking for IBM, ICL or UNIVAC experienced personnel. They offer C.P.S. profit sharing, flexitime and subsidised canteen with excellent career prospects. (Programmers should have COBOL or PL/1 experience). CW 44/13, Annette.

## Programmers N. London £4,000 to £5,500

Only 1¼ years' COBOL experience is required to work with this secure Government organisation. This ICL installation is soon to be New Range (2900) and then your COBOL GIII experience will be invaluable. CW 44/14, Annette.

## Senior Programmer Victoria £6,000

A friendly and profitable Service Bureau using IBM computers are looking for an ambitious COBOL/DOS applicant. As well as varied applications to work on there are L.V.'s 3 weeks' holidays and C.P.S. CW 44/15, Annette.

## Systems Analyst Victoria £6,000

An ICL oriented commercial organisation requires an experienced analyst used to working on their own who has programming experience. Applicants include accounts and labour market trends and statistics. Perks include BUPA, L.V.s, 4 weeks' holidays, C.P.S., etc. CW 44/16, Annette.

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CHISWICK W4 3BR
*Recruitment Consultants*
**01-995 3883 or
01-958 6138 evenings**

# SELL, MARKET, SUPPORT

## THE SYSTEMS OF THE FUTURE

# TODAY!

We are recruiting for a truly exciting U.S. and Internationally based mini computer supplier, whose products are taking the commercial, industrial and OEM market places by storm. Their products are in the very forefront of computer technology, and they have today what many of their competitors talk of having tomorrow.

### MINI COMPUTER SALES ENGINEERS

**Base Salary: circa £6,500 on quota earnings circa £10,000 plus 2 litre car, plus profit sharing**

Opportunities exist for two professional salesmen with proven track records in the mini computer market place. Ideally candidates living within a fifty mile radius of Manchester or Bedford are required. However generous relocation expenses will be paid to suitable applicants. Responsibilities will include management of existing accounts and the development of new business, in this exciting and fast moving market place. Excellent state of the art products for wide ranging applications are available, backed by excellent technical support.

### DATA TERMINAL SALES ENGINEER

**Base Salary circa £5,500, on quota earnings circa £8,000 plus 2 litre car, plus profit sharing**

For this position our clients require a professional salesman with a proven track record in this fast moving, high volume sector of the market. Our clients offer a comprehensive range of intelligent and non-intelligent devices, utilising some of the most advanced technology available. Location for this position—ideally within daily travelling distance of Slough, although generous relocation expenses will be paid, where necessary.

### TECHNICAL SUPPORT ENGINEERS

**Salary to £6,500 plus profit sharing**

Our clients require three technical support engineers to provide technical know-how to the rapidly expanding U.K. and International market place. Candidates should be well versed in mini computer software and hardware, and should possess the communicative skills necessary to give high-level presentations to customers, discuss software capabilities, and provide consultancy services to the user base. Applicants should have a good grounding in mini-computer operating systems and have experience on one or more of the following languages: COBOL, FORTRAN or BASIC.

### PRODUCT MARKETING ENGINEER

**Salary to £6,500 plus profit sharing**

These are out-of-the-ordinary opportunities for technical or sales people to move into a true product marketing role. You will need to be technically qualified to HNC or Degree level, and have a minimum of two years mini-computer experience. Responsibilities will include market research and analysis, product specification, merchandising and sales strategy. The production of quotations and proposals from a technical and profitability viewpoint, will be required.

Candidates for all the above positions should be ideally aged between 25-35, and be educated to HNC/Degree standard. Our clients offer above average terms and conditions of employment; including relocation package, pension scheme, non-contributory life assurance and private patients plan. Initial interviews will be held in Manchester, Birmingham and London.

CONTACT: DAVID WADE On 061-833 0676 REF. NO. CW/11/1

SPECIALIST COMPUTER RECRUITMENT LTD.
**BIRMINGHAM 021-236 3781 FREEPOST**
Freepost, Equity and Law House, 35-37 Great Charles Street Queensway, Birmingham B3 2BR
**MANCHESTER 061-833 0676 FREEPOST**
Freepost, Corn Exchange Buildings, Corporation Street, Manchester M4 3BD
**LONDON 01-935 0671 FREEPOST 6**
Freepost 6, 102, Blandford Street, London W1E 1JZ

SCR

Computing Services Association



# Systems Analysts

**London/Home Counties to £6,000+**

Our client, a major international manufacturer launching a new small business computer, has vacancies in both London and the Southern Home Counties.

This is a ground floor opportunity for those men and women who wish to grow with one of the most prestigious names around.

In particular, there are vacancies for:

**Senior Systems Analysts to £6,000**
**Systems Analysts to £5,500**
**Document Writers to £4,500**

The benefits package, which includes a car allowance, is excellent and the promotion prospects are real. So either send me details of your career to date, or telephone for an application form. All replies will be treated in strict confidence and you may mention companies to which your reply should not be sent. Quote ref C/198.

Brian Withers

GRS

Gerrard Recruitment Service
10, Argyll Street, London W1V 2BQ. Tel: 01-437 6816.



# International operating opportunities at Greenford.

As our new DP Centre in Greenford nears completion, we are in a position to offer experienced men and women the rare opportunity to operate in the front line of a major international project—directly contributing to the marketing of the computer systems.

As members of small, close-knit teams, you will be helping Marketing Representatives and Customer Engineers to service our customers' international marketing needs. You'll be responsible for controlling day-to-day operations: identifying and solving functional problems; and anticipating any technical changes likely to affect the existing environment.

Based on a sophisticated concept new to IBM in the UK, the centre will initially run with our IBM System/370 Model 168, and System 370 Models 158 MP and AP. However, planned growth within the first quarter includes the adoption of MSS.

We're looking for men and women with at least 3 years' experience of large systems—ideally System/370—covering MVS, VM, JES 2, IMS, VTAM, TCAM, and BTAM.

Competitive salaries will be supported by a substantial range of benefits; and the scope for career development in this new and exciting situation is considerable.

Please write to or phone for an application form, Anne Dare, IBM United Kingdom Limited, 389 Chiswick High Road, London W4 4AL.
Tel: 01-995 1441 Ext. 4786, quoting ref: CW 93348

IBM



# Computer Programmer

**South Woodford — Competitive Salary**

Martin the Newsagent Ltd., a large national retail organisation, require a Programmer with at least one year's practical experience in RPG 2 language on IBM systems. Our expanding company is currently operating an IBM 370/115 computer with DOS/VS and power/us and our small but busy team of programmers is engaged in a wide range of systems work.

Salary negotiable according to experience.

Come and join the team at Martin.

Written applications to: Mr. P. Brown, Martin the Newsagent Ltd., Raven Road, South Woodford, London, E18.

MARTIN



# London's Transport Systems

**A real challenge for professional Analysts and Programmers**

**ANALYSTS and SENIOR PROGRAMMERS**
**£5,000-£5,460 p.a.**

+ valuable free travel on London Transport services at all times.

We've a large, fast expanding data processing department involved in a fascinating variety of work, including support functions as well as bus and tube operations

Right now we need more professional Analysts and Programmers at all levels to help us in our D.P. Development Group. We offer you the opportunity to use a wide range of hardware and software including:

- Two ICL 1904S and 2903/4 computers (using G2, G3, MOP, Maximop and ETS)
- IBM 370/145 using OS/VS1, CICS and DL1
- Real-time, on-line and batch systems
- Database development
- Distributed processing
- COM
- Computer typesetting

**Career scope is excellent and there is always a high level of development work and a wide variety of applications.** We have vacancies for commercially orientated Analysts and Senior Programmers. We also require a staff with a scientific or engineering background to play a major part in the developments of advanced technical applications involving

- Computer Aided Design
- Mini and Microprocessors
- Real-time and process control techniques

Applicants will probably have at least a Higher National Diploma or similar qualification and where appropriate have extensive experience in the use of COBOL, FORTRAN, or CORAL 66.

Like to know more? Then call the Systems Manager on (01) 637 9144, or write to Staff Appointments and Development Officer (ref 286C), London Transport, 55 Broadway, SW1H 0BD



# HOLLAND RPG II

## c. £8,500

Double your income by working in Holland! Although the cost of living is more, you will be a lot better off.

Our clients are a service organisation, and the first project will be on IBM System 32 (upgrading next year). They will find initial accommodation for you. The working language is English.

This opportunity will interest candidates with upwards of two years' RPG II programming experience on System 32 or System 3.

***Please ring us in confidence for an exchange of information, quoting ref. 792, or leave a message on our answering machine after hours.***

Tel: 01-637 5796

EDP Systems
52-53 Margaret Street
London W1N 7FF



# STATISTICIAN/ MATHEMATICIAN

required by the Medical Research Council Cyclotron Unit for varied work connected with the biological programme of the unit. Work includes solving statistical problems arising in experimental research, computer programming with the Unit computer and the processing of data acquired by a data logging system. A degree or equivalent qualification in mathematics, statistics or a relevant subject, is essential. Some knowledge of computer programming an advantage.

Salary, according to age and experience, in the range £3336-£4810 (inclusive of pay supplements and London weighting) plus four weeks annual leave.

For further information and application forms, please contact Mrs. R. Marchant, MRC Cyclotron Unit, Hammersmith Hospital, Ducane Road, London W12 0HS. Tel: 01-743 4584 ext. 103. Ref. PT/2.




## THE SALES BIT

# Thirty questions before the first call

LIGHT years ago, when the late, great Frank Smith was king of IBM sales training — and you had to make it both as a programmer and a systems engineer before you could be a salesman — I attended my final sales training course before being released on to an unsuspecting manufacturing industry.

During one of the many role-playing exercises, I was asked to meet with a prospective client who had apparently "phoned in to see if IBM could help with his invoicing problem."

My job: sell him a big bunch of lean and mean kit!

I guess it must have taken me half an hour or so to discover that the so-called prospect manufactured battleships, or something, and produced two or three invoices a year.

It might have taken even longer had I not detected in my peripheral vision a large proportion of my classmates peeing themselves. I goofed! I wasn't prepared, I was insensitive, I didn't ask the right questions.

The various aspects of the sales cycle provide good material for future articles, but on this occasion let us limit the discussion to the pre-preparation of the first call.

Assuming that effective questioning and research has taken place during the prospecting stage, what should a salesman ask himself before making the first call? There are a lot of considerations to make.

1 What is the current company name?
2 What is their financial situation?
3 How many employees do they have?
4 What is the nature of their business?
5 What are the likely applications areas?
6 Am I calling on the ultimate decision maker and what do I know about him?
7 If not, who is the ultimate decision maker and what do I know about him?
8 What is my plan for meeting with the ultimate decision maker?
9 Has my own organisation been in contact with this company before?
10 If so, was a proposal made and for what applications?
11 Can any of my colleagues provide me with information on this company or the possible applications areas?
12 Is this company part of a larger organisation or group of companies?
13 Do we deal with any other company in this group?
14 Do we deal with any other organisation in the same industry?
15 Do we want to reference sell?
16 Are we authorised to reference sell?
17 Do they already use computers?
18 If so, which supplier(s)?
19 What is my plan for the structure of the call?
20 What objectives do I want to achieve in this call?
21 What will be my device for "opening" the interview?
22 Am I well prepared for the subject to be discussed?
23 Did the client ask me to bring anything with me?
24 Have I prepared the appropriate sales aids?
25 What are the likely benefits to the client?
26 What objections might be raised and what will be my logical rebuttals?
27 What unexpected events could possibly occur?
28 What do I plan to leave with the client/prospect in order to stimulate his interest after the call?
29 Do I need any assistance from my sales manager?
30 Are my flies fastened?

You could do worse than use this as a basis for creating your own personal check-list whether you are a salesman or a mere mortal.

**TRADER**

## PRODUCTS

### Control unit

USERS of IBM mainframes are now being offered, by Itel, a disc control unit that provides all the support features of the IBM 3333 plus the facility of static dual port switching.

Called the 7333, the control unit can support eight IBM 3330 compatible disc drives from Itel's own 7330 series. They can be the models 7330-1, 7330-10 or 7330-11 and can be intermixed.

The 7333 enables the Itel 7330 drives to be connected to an IBM 3830-2 disc control unit or to an IBM Integrated Storage Control (ISC) unit and, Itel points out, the dual port switching provided by the 7333 enables configurations to have duplex controllers.

Itel International (CW), Bowater House, 68 Knightsbridge, London, SW1X 7LN. Tel: 01-741 1482.

### Battery

USERS of Sweda 250, 350 and 450 electronic cash registers can now obtain back-up battery power packs from the manufacturers.

The changeover from mains to battery operation is automatic following a power failure. When the mains supply is restored, the battery is automatically recharged, whether the cash register is switched on or off. The unit needs no maintenance and its overall dimensions are 370 x 160 x 185 mm (14½ x 6¼ x 7¼ inches).

Sweda International, 27 Goswell Road, London, EC1M 7AL. Tel: 01-253 3090.

### Reader/punch

FROM Data Design Techniques is a self-contained desk-top reader/punch for paper tape.

The reader runs at up to 120 chps and 1,200 baud and the punch runs at up to 60 chps and 600 baud. It interfaces to any terminal or system which has a V24 serial port. The device regenerates the V24 port for onward presentation to the modem. It costs £950.

Data Design Techniques Ltd (CW), 6 Watkin Road, Wembley, Middlesex, HA9 0TF. Tel: 01-903 6977.

### Puzzle answer

The third formula is $7^3-6^3-3^3$.